

August 19, 2020

# GULF OF ALASKA OIL AND GAS EXPLORATION LICENSE

Final Written Finding of the Director



Alaska Department of  
**NATURAL  
RESOURCES**  
DIVISION OF OIL & GAS

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Final Written Finding of the Director

Prepared by:  
Alaska Department of Natural Resources  
Division of Oil and Gas

August 19, 2020



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## Contents

## Page

### Chapter One: Director’s Final Written Finding and Decision

A. Gulf of Alaska Procedural Background .....	1-1
B. Statement of Applicable Law .....	1-2
C. Analysis Summary .....	1-2
D. Decision.....	1-4

### Chapter Two: Authority and Scope of Review

A. Constitutional and Statutory Authority .....	2-1
B. Written Findings.....	2-1
C. Review by Phase .....	2-4
D. Licensing Process.....	2-4

### Chapter Three: Description and Location of the License Area

A. Property Location and General Description .....	3-1
B. Land and Mineral Ownership .....	3-1
C. History and Cultural Resources .....	3-10
D. Local Communities .....	3-11
E. Climate .....	3-15
F. Natural Hazards.....	3-19
G. References .....	3-23

### Chapter Four: Habitats, Fish, and Wildlife

A. Habitats of the Area .....	4-1
B. Fish and Wildlife Populations .....	4-4
C. References .....	4-35

### Chapter Five: Current and Projected Uses

A. Designated Habitat Areas .....	5-1
B. Current and Projected Uses in the License Area.....	5-4
C. References .....	5-19

### Chapter Six: Petroleum Potential and the Likely Methods of Oil and Gas Transportation in the License Area

A. Geology .....	6-1
B. Phases of Oil and Gas Development .....	6-4
C. Oil and Gas Exploration, Development, and Production Activities.....	6-6
D. Likely Methods of Oil and Gas Transportation in the License Area.....	6-10
E. Spill Risk, Prevention, and Response.....	6-14
F. References .....	6-26

### Chapter Seven: Governmental Powers to Regulate Oil and Gas

A. State of Alaska .....	7-1
B. Federal .....	7-11
C. Other Federal and State Regulatory Considerations .....	7-14
D. References .....	7-16

### Chapter Eight: Reasonably Foreseeable Effects of Licensing and Subsequent Activity

A. Introduction .....	8-1
B. Reasonably Foreseeable Cumulative Effects on Air.....	8-2
C. Reasonably Foreseeable Cumulative Effect on Water Resources and Water Quality.....	8-3
D. Reasonably Foreseeable Cumulative Effects on Terrestrial and Freshwater Habitats and Fish and Wildlife Populations .....	8-7

E. Reasonably Foreseeable Cumulative Effects on Coastal and Marine Habitats and Fish and Wildlife Populations .....	8–14
F. Reasonably Foreseeable Cumulative Effects on Fish and Wildlife Uses.....	8–27
G. Reasonably Foreseeable Cumulative Effects on Historic and Cultural Resources .....	8–31
H. Reasonably Foreseeable Fiscal Effects of the Disposal and Subsequent Activity on the State and Affected Municipalities and Communities .....	8–32
I. Other Reasonably Foreseeable Effects on Municipalities and Communities Near the License Area...	8–37
J. Mitigation Measure Evaluation .....	8–38
K. References .....	8–39
<b>Chapter Nine: Mitigation Measures</b>	
A. Mitigation Measures .....	9–1
B. Definitions .....	9–8
<b>Appendix A: Summary of Comments and Responses</b>	
A. Comments and Responses to the Preliminary Written Finding issued August 2, 2019.....	A–1
B. MOA Meeting February 27, 2017 .....	A–13
C. MOU Consultation October 25, 2016 .....	A–13
D. Comments and Responses to May 21, 2015 Solicitation.....	A–15
E. References .....	A–37

## Tables

	Page
Table 2-1. Topics required by AS 38.05.035(g)(1)(B). .....	2–3
Table 3-1. Temperature (°F) and precipitation (inch) 1981–2010 normal means for stations near the License Area. ....	3–16
Table 3-2. Wind speeds (knots) and wave heights (feet) for AOOS stations near the License Area.....	3–16
Table 4-1. Marine mammals potentially present in or near the License Area. ....	4–27
Table 5-1. Bering River District drift gillnet fishery harvest and value 2015–2017.....	5–9
Table 5-2. Nominal Prince William Sound permit values, 2000–2016 .....	5–9
Table 5-3. Nominal total Prince William Sound permit earnings, 2000–2016.....	5–9
Table 5-4. Economic impact of sport fishing in Alaska in 2001, 2003, 2006, 2011, and 2016. ....	5–12
Table A-1. Commenter groups for preliminary written finding comments. ....	A–1
Table A-2. Issue and comment topics for preliminary written finding comment summary and response....	A–2
Table A-3. Comment topics by commenter for issues on the preliminary written finding.....	A–9

## Figures

	Page
Figure 3.1. Gulf of Alaska Area Map .....	3–5
Figure 3.2. Gulf of Alaska Land Status Map .....	3–6
Figure 3.3. Coastal Uplift Lands Managed by US Forest Service Map.....	3–7
Figure 3.4. Bering River-Controller Bay Trumpeter Swan Management Area Map.....	3–8
Figure 3.5. Copper River Delta Fish and Wildlife Management Area Map .....	3–9
Figure 3.6. Predominant wind from direction for AOOS stations near the License Area. ....	3–17
Figure 5.1. Critical Habitat Area and Anadromous Rivers in and adjacent to the License Area.....	5–2
Figure 5.2. Gulf of Alaska Game Management Units .....	5–16

# Chapter One: Director's Final Written Finding and Decision

## Contents

	Page
A. Gulf of Alaska Procedural Background .....	1-1
B. Statement of Applicable Law .....	1-2
C. Analysis Summary .....	1-2
D. Decision.....	1-4

# Chapter One: Director's Final Written Finding and Decision

The State of Alaska encourages exploration in areas far from existing infrastructure, with relatively low or unknown hydrocarbon potential, through the exploration license program under AS 38.05.131 – 134. Prior to a disposal, the Alaska Department of Natural Resources (DNR) Division of Oil and Gas' (DO&G) director considers all matters set out in AS 38.05.035(e) and (g) in a written finding that determines whether the state's interests are best served by issuing an exploration license. To develop this finding, the director considered all applicable statutes and regulations, weighed the facts and comments received during public review, and balanced positive and negative effects of potential oil and gas activities. This final finding is the director's decision under AS 38.05.133(f). After considering all relevant facts and issues known or made known to the director, the director finds that the state's best interests are not best served by issuing the Gulf of Alaska Oil and Gas Exploration License (License or License Area) to Cassandra Energy Corporation (Licensee).

## A. Gulf of Alaska Procedural Background

On April 23, 2015, DO&G received a timely exploration license application from Cassandra Energy Corporation. To ensure confidentiality under AS 38.05.035(a)(8), and at the applicant's request under AS 38.05.133(e), DO&G kept confidential the name of the applicant for the notice of intent comment period. With issuance of the preliminary finding DO&G identified the prospective licensee as Cassandra Energy Corporation (AS 38.05.133(f)). The timeline for the Gulf of Alaska Exploration License process from receipt of the application to publication of this final finding follows:

- On May 21, 2015, DO&G published a notice of intent to evaluate the exploration license proposal, request for comments on exploration within the solicitation area, and request for competing proposals.
- On May 21, 2015, DO&G requested agency information on proposed oil and gas exploration in the area. Information submissions were due by July 20, 2015.
- On June 8, 2015, DO&G extended the public comment period. Comments were due by August 3, 2015. Competing proposals were due by July 20, 2015.
- DO&G did not receive any competing proposals within the allotted time.
- DO&G received 26 timely comments to the request for agency information and call for comments. These comments were addressed, and information was incorporated into the preliminary finding. Comments are summarized with DNR responses in Appendix A.
- On May 9, 2016, DO&G issued the Director's Final Determination of State Lands Subject to Oil and Gas Exploration Licensing for the Southcentral Region of Alaska (Final Determination), as required under AS 38.05.131(c), which includes the License Area.
- The Final Determination was appealed on May 27, 2016. On December 22, 2017, the DNR commissioner resolved the appeal by affirming DNR's decision that exploration licensing is available in Southcentral Alaska.



- On August 2, 2019, DO&G issued the Gulf of Alaska Oil and Gas Exploration License Preliminary Written Finding, approving the Exploration License, with a public comment deadline of October 4, 2019.
- On August 26, 2019, DO&G extended the public comment deadline to November 4, 2019.
- DO&G received 136 timely comments in responses to the call for comments on the preliminary written finding. These comments were addressed, and information was incorporated throughout this finding. Comments are summarized with DNR responses in Appendix A.

## **B. Statement of Applicable Law**

The Alaska Constitution directs the state “to encourage... the development of its resources by making them available for maximum use consistent with the public interest” (Alaska Const. art. VIII, § 1). Moreover, by statute, the people of Alaska have an interest in the development of the state’s oil and gas resources to maximize both the economic and physical recovery of the resources in addition to maximizing competition among parties seeking to explore and develop the resources (AS 38.05.180(a)). The director enables the disposal of lands through the development of written findings under AS 38.05.035(e). The preparation and issuance of written findings by the director are subject to the following:

- AS 38.05.035(e)(1)(A) allows the director to establish the scope of the administrative review on which the director’s determination is based, and the scope of the written finding supporting that determination.
- AS 38.05.035(e)(1)(B) allows the director to limit the scope of an administrative review and finding for a proposed disposal to a review of applicable statutes and regulations, and facts pertaining to the land, resources, property, or interest in them that the director finds are material to the written finding and are known or available to the director during the administrative review.
- AS 38.05.035(e)(1)(C) allows the director to limit a written finding to the disposal phase, which is the issuance of an exploration license, and oil and gas leases if the license is converted.
- AS 38.05.035(h) provides that in preparing a written finding under AS 38.05.035(e)(1), the director may not be required to speculate about possible future effects subject to future permitting that cannot reasonably be determined until the project or proposed use for which a written finding is required is more specifically defined.

## **C. Analysis Summary**

The final written finding considers several significant changes to the exploration license that were not a part of the preliminary written finding. The changes are a result of interagency management agreements and consideration of public comments. DNR conducted additional analysis of the project as revised.

Due to restrictions created by interagency management agreements, the land included in the License Area has been reduced since publication of the preliminary written finding. The License Area consists of approximately 65,773 acres of land and water in and around Controller Bay from north of the Okalee Spit northwest to Katalla Bay and Point Martin. The boundary of the License Area includes the eastern edge of the Copper River Delta State Critical Habitat Area. State-owned uplands in the License Area are limited to about 1,346 acres. There are an additional estimated 4,822 acres of state-owned coastal lands (uplands) within the License Area that are currently managed by the United States Forest Service (USFS) under a March 1992 Memorandum of Agreement (MOA) between the USFS and DNR.

Under the MOA, coastal lands are defined as those areas uplifted or subsided because of the 1964 earthquake. The MOA assigns management authority of uplifted coastal lands adjacent to Chugach National Forest to the USFS. DNR and USFS must concur on land use commitments lasting more than ten years. DNR and USFS were unable to concur on the inclusion of the state-owned coastal lands that are managed by USFS along the coast of Controller Bay. In a September 25, 2019 letter in response to the preliminary written finding, USFS requested that the coastal lands be excluded from the License Area. Onshore lands within the License Area are limited to the 1,346 acres of state-owned uplands at Palm Point and the mouth of the Katalla River. This change in land area from the preliminary written finding presents logistical challenges for oil and gas mobilization, exploration, and development activities due to shallow waters and navigation hazards in Katalla Bay; a narrow entrance with rocky shoals and shifting gravel bar at the Katalla River mouth; and the limited amount of state-owned land suitable for staging equipment and siting drilling locations.

Due to both an interagency management agreement and public comments, several mitigation measures have been revised in the final written finding. The License Area is subject to the October 1986 Copper River Delta Fish and Wildlife Management Area Memorandum of Understanding (MOU), which requires coordination for resources planning and policy development among the signatories that include: Alaska Department of Fish and Game (ADF&G), Bureau of Land Management (BLM), United States Fish and Wildlife Service (USFWS), USFS, and DNR. Because the MOU requires DNR to consider fish and wildlife values on state lands within the management area, DNR collaborated with the other agencies to develop mitigation measures contained within this finding. Some of the mitigation measures were revised from the preliminary written finding to the final written finding based on comments received from MOU agencies and members of the public.

As a result, the mitigation measures adopted in the final written finding prohibit the siting of oil and gas facilities or infrastructure (including platforms, jack-up rigs, and pipelines) seaward of the mean high water mark at this time, and oil and gas exploration, development, and major maintenance activities would only be permitted between November 1 to March 31.

Seasonal oil and gas activity restrictions combined with local severe winter weather conditions may increase the risk of accidents and spills during exploration, development, and production activities. The License Area is in a remote location about 40 miles east of Cordova with limited logistical resources or support in the vicinity. In response to the preliminary finding several commenters, noted that harsh weather conditions in Controller Bay and the Gulf of Alaska would hamper or prevent spill response during winter. Wind speeds and wave heights near the License Area are nearly double during November to March compared to the summer months.

The License Area and adjacent Copper River delta is a significant region for the state's commercial, subsistence, and sport fisheries. Within the License Area, the Bering River District gillnet salmon fishery has the greatest potential for direct conflict with and impacts from oil and gas activities, both because of the potential for increased coastal vessel traffic, and the potential for oil spills. The Bering River District salmon harvest had an average annual value of about \$900,000 during 2015 to 2017, which represents about 5 percent of the Copper River District harvest. Prevailing tides and currents would likely transport oil spills reaching Controller or Katalla bays into the Copper River delta which could impact multiple fisheries. Commercial fisheries for scallops, groundfish, and tanner crabs are present in and around the License Area. Moreover, subsistence and sport fisheries represent important resource uses in the License Area.

There is a potential that an oil and gas exploration project would boost the economy of the nearby communities, including Cordova, with local jobs in the oil and gas industry and associated support industries. For the state, there will be relatively small positive initial revenue with a licensing fee of \$1 per acre of exploration area, and potential rental and royalty revenue if there is a successful discovery of oil or gas. Because the License Area is not in an organized borough, there would be no property tax revenue being generated to support the local communities' infrastructure.

Several resource evaluations have concluded that the oil and gas resource potential for this area is poor, however there is a documented unconventional shale oil play in the region and there has been commercial quantities of oil produced from Katalla. Onshore geologic maps show the anticlines to be of small amplitude, tightly compressed, and complex, and the nearby wells show little conventional porosity. Thus, for conventional plays, the exploration challenge is to locate undrilled traps of sufficient size to justify economic development. A large find would be necessary to justify the expense of facilities required to transport oil or gas to market. The exploration challenge is compounded by the reduced size of the License Area, setbacks from the anadromous water bodies, and offshore infrastructure restrictions.

## **D. Decision**

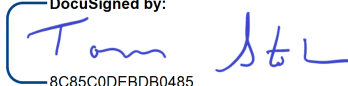
The director considered all applicable statutes and regulations, weighed the facts and comments received during public review, and balanced the potential positive and negative effects of oil and gas activities in the License Area during the development of this finding.

The changes to the exploration license are significant. The reduced acreage of the License Area and seasonal restrictions cause logistical challenges for mobilization; limit the amount of land for staging equipment and siting drilling locations; create challenges for bringing any discovered oil to market; and reduce exploration, development, and production activities to an annual five month period during which response times to potential spills could be slowed. While mitigations would lessen those impacts, a large find would be required to justify the expense of facilities. Current geologic data for the area does not appear to support the likelihood that a large, undisturbed petroleum system of the size needed to support a complex development and transportation scenario would be present. Given this, the potential positive effects of the exploration license do not clearly outweigh or balance the potential negative effects to the other resources and habitat of the License Area and the potential impacts to cultural resources.

No one resource is considered more intrinsically valuable or important than another. Oil and gas exploration, development, and production are proven to be compatible with other uses of natural resources across the state. However, after applying the relevant facts and mitigation measures and considering the project as a whole, the director reverses the decision of the preliminary written finding and finds the potential benefits of issuing the exploration license do not outweigh the potential negative effects, such that issuance of the Gulf of Alaska Oil and Gas Exploration License does not best serve the interests of the State of Alaska.

A person affected by this decision who provided timely written comment on this decision may appeal in accordance with 11 AAC 02. Any appeal must be received within 20 calendar days after the date of "issuance" of this decision, as defined in 11 AAC 02.040(c) and (d), and may be mailed or delivered to Commissioner, Department of Natural Resources, 550 W. 7th Avenue, Suite 1400, Anchorage, Alaska 99501; faxed to 1-907-269-8918; or sent by electronic mail to [dnr.appeals@alaska.gov](mailto:dnr.appeals@alaska.gov).

An eligible person must first appeal this decision in accordance with 11 AAC 02 before appealing this decision to Superior Court. If the commissioner does not act on an appeal within 30 days after issuance of this decision, the appeal is considered denied and this decision becomes a final administrative order and decision by the 31st day after issuance for the purposes of an appeal to Superior Court. A copy of 11 AAC 02 may be obtained from any regional information office of the Department of Natural Resources.

DocuSigned by:  
  
8C85C0DEBDB0485...  
Tom Stokes

Director, Division of Oil and Gas

# Chapter Two: Authority and Scope of Review

## Contents

	Page
A. Constitutional and Statutory Authority .....	2-1
B. Written Findings .....	2-1
1. Applicable Law and Facts .....	2-2
2. Scope of Review .....	2-2
a. Reasonably Foreseeable Effects .....	2-2
b. Matters Considered and Discussed .....	2-3
C. Review by Phase .....	2-4
D. Licensing Process .....	2-4
3. Licensing Proposal .....	2-4
4. License Proposal Notice and Preliminary Finding .....	2-5
5. Appeal .....	2-6

## Tables

	Page
Table 2-1. Topics required by AS 38.05.035(g)(1)(B). .....	2-3

## Chapter Two: Authority and Scope of Review

The Alaska Department of Natural Resources (DNR), Division of Oil and Gas (DO&G) finds it not to be in the state’s best interest to offer the Gulf of Alaska oil and gas exploration license (License or License Area) to Cassandra Energy Corporation.

This is the director’s final written finding and decision issued under AS 38.05.035(e). As required, this chapter establishes the scope of the administrative review and scope of the written finding for the License Area.

### A. Constitutional and Statutory Authority

The Alaska Constitution provides that the general policy of the state is “to encourage... the development of its resources by making them available for maximum use consistent with the public interest” and that the “legislature shall provide for the utilization, development, and conservation of all natural resources belonging to the State... for the maximum benefit of its people” (Alaska Constitution, Article VIII, §§ 1 and 2). The legislature has been empowered to make all policy decisions to carry out these general goals, as well as to provide the policies and procedure for the lease, sale, and granting of state-owned land (Alaska Constitution Article VIII, §§ 8, 9, and 12). The Alaska Land Act guides the land management and disposal policy of the state. The Act, codified at AS 38.05, provides the commissioner of DNR the authority to select, manage, and dispose of state lands, and directs DNR to implement the requisite statutes. The commissioner has delegated authority for these disposals to the director of DO&G under DNR Department Order 003.

Title 38 of the Alaska Lands Act states the people of the state “have an interest in the development of the state’s oil and gas resources to maximize the economic and physical recovery of the resources” (AS 38.05.180(a)(1)(A)). Further, the legislature found that it is in the state’s best interests to “minimize the adverse impact of exploration, development, production and transportation activity,” and “to offer acreage for oil and gas leases or for gas only leases.” (AS 38.05.180(a)(2)(A)(ii); AS 38.05.180(a)(2)(B)).

AS 38.05.180(a)(2) further provides it is in the state’s best interest to encourage an assessment of its oil and gas resources; allow the maximum flexibility in the methods of issuing leases to recognize the many varied geographical regions of the state and the different costs of exploring for oil and gas in these regions and minimize the adverse impact of exploration, development, production, and transportation activity; and to offer acreage for oil and gas leases.

### B. Written Findings

Alaska statutes govern the disposal of state-owned mineral interests. Under AS 38.05.035(e), the director may, with the consent of the commissioner, dispose of state land, resources, property, or interests after determining in a written finding that such action will serve the best interests of the state. The written finding is known as a “best interest finding” and describes the License Area, considers and discusses the potential effects of the license, describes measures to mitigate those effects, and constitutes the director’s determination whether the interests of the state will be best served by the disposal. DO&G provided a first opportunity for public comment during the

solicitation for comments and competing proposals. DO&G provided a second opportunity following the issuance of the preliminary written finding. This final written finding includes a discussion of material issues raised during the comment periods, as well as a summary of the comments received (See Appendix A).

## **1. Applicable Law and Facts**

The best interest finding requirements outlined in AS 38.05.035 provide DNR with procedures to ensure Alaska's resources are developed for the maximum benefit of the state as mandated by article VIII, § 2 of the Alaska Constitution. The authorities applicable to this written finding include the requirements and procedures set out in AS 38.05.035(e)–(m), and Alaska case law applicable to the disposal phase. The provisions in AS 38.05.035(e) set out the scope of review and process for the written finding.

The statute also expressly empowers DNR to review projects in phases, allowing the analysis of proposed licensing or leasing to focus on the issues pertaining to the disposal phase and the reasonably foreseeable significant effects of licensing or leasing. (AS 38.05.035(e)(1)(C)). Further explanation of the statutory direction is provided in the sections below. The regulatory authorities governing exploration, development, production, and transportation of oil and gas development are discussed further in Chapter Seven.

## **2. Scope of Review**

As required by AS 38.05.035(e)(1)(A)–(C), the director, in the written finding:

- shall establish the scope of the administrative review on which the director's determination is based, the scope of the written finding supporting that determination, and the scope of the administrative review and finding may only address reasonably foreseeable, significant effects of the uses proposed to be authorized by the disposal;
- may limit the scope of an administrative review and finding for a proposed disposal to a review of: (1) applicable statutes and regulations; (2) facts pertaining to the land, resources or property, or interest in them that are material to the determination and known to the director or knowledge of which is made available to the director during the administrative review; and (3) issues that, based on the applicable statutes, regulations, facts, and the nature of the uses sought to be authorized by the disposal the director finds are material to the determination of whether the proposed disposal will serve the best interests of the state; and
- may, if the project for which the proposed disposal is sought is a multi-phased development, limit the scope of an administrative review and finding for the proposed disposal to the applicable statutes, and regulations, facts and issues that pertain solely to the disposal phase of a project when the conditions of AS 38.05.035(e)(1)(C)(i)–(iv) are met.

### **a. Reasonably Foreseeable Effects**

The scope of this administrative review and written finding addresses only the reasonably foreseeable, significant effects of the uses proposed to be authorized by the disposal

(AS 38.05.035(e)(1)(A)). A detailed discussion of the possible effects of unknown future exploration, development, and production activities is not within the scope of this best interest finding. Therefore, the director has limited the scope of this written finding to the applicable statutes and regulations, facts, and issues pertaining solely to the License Area, and the reasonably foreseeable significant effects of the license disposal. However, this finding does discuss the potential cumulative effects, in general terms, that may occur with oil and gas activities related to exploration, development, production, and transportation within the License Area and any mitigation measures as required by AS 38.05.035(g)(1) and (2).

## b. Matters Considered and Discussed

Pursuant to AS 38.05.133(f), a written finding must consider and discuss facts related to topics set out under AS 38.05.035(g)(1)(B)(i)–(x) that are known at the time the finding is being prepared. The director must also consider comments submitted during the public comment period and within the scope of review set out in Sections A and B.1–2 of this Chapter. This document is organized for ease of reading and reviewing and does not necessarily follow the order as found in AS 38.05.035(g)(1)(B) (Table 2.1).

**Table 2-1. Topics required by AS 38.05.035(g)(1)(B).**

AS 38.05.035(g)(1)(B) subsection number	Description	Location in this document
i	Property descriptions and locations	Chapter Three
ii	Petroleum potential in general terms	Chapter Six
iii	Fish and wildlife species and their habitats in the area	Chapter Four
iv	Current and projected uses in the area; including uses and value of fish and wildlife	Chapter Five
v	Governmental powers to regulate the exploration, development, production, and the transportation of oil and gas or of gas only	Chapter Seven
vi	Reasonably foreseeable cumulative effects of exploration, development, production, and transportation for oil and gas or for gas only on the License Area, including effects on subsistence uses; fish and wildlife habitat and populations and their uses, and historic and cultural resources	Chapter Eight
vii	Stipulations and mitigation measures, including any measures to prevent and mitigate releases of oil and hazardous substances, to be included in the license, and a discussion of the protections offered by these measures	Chapter Nine
viii	Method or methods most likely to be used to transport oil or gas from the License Area, and the advantages, disadvantages, and relative risks of each	Chapter Six
ix	Reasonably foreseeable fiscal effects of the license disposal and the subsequent activity on the state and affected municipalities and communities	Chapter Eight
x	Reasonably foreseeable effects of exploration, development, production, and transportation involving oil and gas or gas only on municipalities and communities within or adjacent to the License Area	Chapter Eight



The facts and issues under consideration in this finding may address only reasonably foreseeable, significant effects of the uses proposed to be authorized by any future disposals in the License Area (AS 38.05.035(g); AS 38.05.035(e)(1)(A)). The director may not be required to speculate about possible future effects subject to future permitting that cannot reasonably be determined until the proposed use subject to the best interest finding is more specifically defined (AS 38.05.035(h)).

## **C. Review by Phase**

The director may limit the scope of an administrative review and finding for a proposed disposal when the director has sufficient information and data available upon which to make a reasoned decision. A discussion of phases of oil and gas activities is contained in Chapter Six.

Under AS 38.05.035(e)(1)(C), if the project for which the proposed disposal is sought is a multi-phased development, the director may limit the scope of an administrative review and finding for the proposed disposal to the applicable statutes and regulations, facts, and issues that pertain solely to the disposal phase of the project under the following conditions:

- (i) the only uses to be authorized by the disposal are part of that phase;
- (ii) the disposal is a disposal of oil and gas, or of gas only, and, before the next phase of the project may proceed, public notice and the opportunity to comment are provided under regulations adopted by the department;
- (iii) the department's approval is required before the next phase may proceed; and
- (iv) the department describes its reasons for a decision to phase.

Phased review is appropriate for exploration licensing. Although the license applicant may propose specific exploration activities in an application, the issuance of a license does not authorize any oil or gas activities in the License Area without further permits from DNR and other agencies.

## **D. Licensing Process**

### **3. Licensing Proposal**

Prior to reviewing applications for exploration licensing, DO&G must first make a preliminary and final determination of lands subject to exploration licensing. The preliminary determination must be given public notice and following an evaluation of the comments received, a final written determination must be published. On February 2, 2016, under AS 38.05.131(c), the director made a preliminary written determination of state land for Southcentral Alaska. On May 9, 2016, DO&G issued the Final Director's Determination of State Lands Subject to Oil and Gas Exploration Licensing for the Southcentral Region of Alaska which includes the License Area<sup>1</sup>. The Final Determination grants that all state-owned acreage in the Southcentral determination area will be available for oil and gas exploration licensing subject to the provisions of AS 38.05.132.

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<sup>1</sup> The Final Director's Determination of State Lands Subject to Oil and Gas Exploration Licensing for the Southcentral Region of Alaska was appealed on May 27, 2016 and the DNR commissioner resolved the appeal on December 22, 2017.

The state's exploration licensing program<sup>2</sup> supplements the state's conventional oil and gas leasing program by targeting areas outside known oil and gas provinces.<sup>3</sup> The licensing program encourages exploration in areas far from existing infrastructure, with relatively low or unknown hydrocarbon potential, and where there is a higher investment risk to the operator. Through exploration licensing, the state will receive subsurface geologic information about these regions. Furthermore, if production occurs after exploration, the state will also receive additional revenue through royalties and taxes.

The licensing process begins in one of two ways:

1. Annually in April, applicants may submit to the commissioner a proposal for exploratory activity within an area they have specified (11 AAC 82.909(d)); or
2. The commissioner can request proposals anytime to explore areas determined to be subject to the provisions of AS 38.05.132.

Any proposal received by the commissioner must designate how much money the applicant will spend on exploration (the work commitment), the amount and location of acreage desired for licensing, and the term (duration) of the license. An exploration license area may range from 10,000 to 500,000 acres and must be reasonably compact and contiguous (AS 38.05.132(c)(2)). The exploration license term may not exceed 10 years (AS 38.05.132(b)(1)). The proposal need not describe the type of exploration activity, although direct exploration expenditures must meet the requirements of AS 38.05.132(f)(1). However, before any exploration license may be granted or any exploration activity may occur, the proposed activity must first go through the authorization processes required by statute.

#### **4. License Proposal Notice and Preliminary Finding**

The Gulf of Alaska exploration license process was initiated on April 23, 2015 when DO&G received a timely exploration license application from Cassandra Energy Corporation. Agency review and public comments were requested and reviewed as part of the adjudication process for this exploration license proposal. Summaries of the comments received and responses to those comments are included in Appendix A. Chapter 1 contains a more thorough review of the timeline and process for reviewing the license proposal and requesting public comments.

The process for receiving public input begins with a request for information from state and federal agencies, and local governments. DO&G requests information and data about the region's property ownership status, peoples, economy, current uses, subsistence, historic and cultural resources, fish and wildlife, and other natural resource values. Using this information and other relevant

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<sup>2</sup> AS 38.05.131 provides that the oil and gas exploration licenses statutes (AS 38.05.132–.134) do not apply to land:

- 1) north of the Umiat baseline, and
- 2) in the vicinity of Cook Inlet that is within the area bounded by
  - A) the north boundary of Township 17 North, Seward Meridian;
  - B) the Seward Meridian;
  - C) the south boundary of Township 7 South, Seward Meridian; and
  - D) the west boundary of Range 19 West, Seward Meridian.

<sup>3</sup> Known oil and gas provinces include the North Slope, Beaufort Sea, and Cook Inlet areas.

information that becomes available, DO&G develops a preliminary written finding and releases it for public comment (AS 38.05.035(e)(7)(A)).

Once a preliminary written finding is issued, DO&G follows AS 38.05.945(a)(3)(A)-(b)(2) to obtain public comments on the preliminary written finding. Agency and public comments were accepted from the time that the preliminary finding was issued on August 2, 2019 through November 4, 2019. Information provided by agencies and the public assists the director in determining which facts and issues are material to the decision of whether the exploration license is in the state's best interest, and in evaluating the reasonably foreseeable, significant effects of the exploration license. After receiving public comments on the preliminary best interest finding, DO&G reviewed all comments and incorporated additional relevant information and issues into this final written finding. A summary of, and responses to comments received during the public comment period can be found in Appendix A.

## **5. Appeal**

A person affected by the final written finding who provided timely written comment on this decision may appeal in accordance with 11 AAC 02. Any appeal must be received within 20 calendar days after the date of "issuance" of this decision, as defined in 11 AAC 02.040(c) and (d) and include the appropriate fee. An appeal may be mailed or delivered to Commissioner, Department of Natural Resources, 550 W. 7th Avenue, Suite 1400, Anchorage, Alaska 99501; faxed to 1-907-269-8918; or sent by electronic mail to [dnr.appeals@alaska.gov](mailto:dnr.appeals@alaska.gov).

An eligible person must first appeal the final written finding in accordance with 11 AAC 02 before appealing that decision to Superior Court. If the commissioner does not act on an appeal within 30 days after issuance of that decision, the appeal is considered denied and this decision becomes a final administrative order and decision by the 31st day after issuance for the purposes of an appeal to Superior Court. A copy of 11 AAC 02 may be obtained from any regional information office of DNR.

# Chapter Three: Description and Location of the License Area

## Contents

	Page
A. Property Location and General Description.....	3-1
B. Land and Mineral Ownership.....	3-1
1. Memorandum of Agreement Between the USDS Forest Service and the State of Alaska, Department of Natural Resources .....	3-1
2. Bering River-Controller Bay Trumpeter Swan Management Area Cooperative Agreement .....	3-2
3. Copper River Delta Fish and Wildlife Memorandum of Understanding.....	3-3
4. Alaska Native Claims Settlement Act.....	3-4
C. History and Cultural Resources.....	3-10
D. Local Communities.....	3-11
1. Cordova.....	3-11
2. Chenega .....	3-12
3. Tatitlek .....	3-12
4. Valdez .....	3-13
5. City and Borough of Yakutat .....	3-14
E. Climate .....	3-15
1. Current Conditions .....	3-15
2. Climate Change .....	3-17
F. Natural Hazards.....	3-19
1. Earthquakes and Faulting .....	3-19
2. Tsunamis.....	3-20
3. Mass Wasting and Avalanches .....	3-21
4. Glaciers, Icebergs, and Outburst Flooding .....	3-21
5. Mitigation Measures.....	3-22
G. References .....	3-23

## Figures

	Page
Figure 3.1. Gulf of Alaska Area Map .....	3-5
Figure 3.2. Gulf of Alaska Land Status Map.....	3-6
Figure 3.3. Coastal Uplift Lands Managed by US Forest Service Map.....	3-7
Figure 3.4. Bering River-Controller Bay Trumpeter Swan Management Area Map.....	3-8
Figure 3.5. Copper River Delta Fish and Wildlife Management Area Map .....	3-9
Figure 3.6. Predominant wind from direction for AOOS stations near the License Area. ....	3-17

## Chapter Three: Description and Location of the License Area

This chapter considers and discusses the property descriptions and locations of the Gulf of Alaska exploration license area (License Area) as required by AS 38.05.035(g)(1)(B)(i).

### **A. Property Location and General Description**

The License Area is located within Townships 19–21 S., Ranges 5–8 E., Copper River Meridian. It consists of approximately 65,773 acres of state-owned, unencumbered land, approximately 40 miles east of Cordova. The License Area includes state land and water in and around Controller Bay from north of the Okalee Spit northwest to Katalla Bay and Point Martin. The License Area boundary includes the eastern edge of the Copper River Delta State Critical Habitat Area (CHA). The License Area also includes Kanak Island and waters around the mouths of the Bering, Nichawak, Campbell, and Edwards rivers (Figure 3.1 and Figure 3.2). The primary access route to the License Area is by marine vessel. The License Area is not located within a specific borough.

### **B. Land and Mineral Ownership**

The Alaska Statehood Act granted to the State of Alaska the right to select from the federal public domain 102.5 million acres of land to serve as an economic base for the new state. The Statehood Act also granted to Alaska the right to all minerals underlying these selections and specifically required the state to retain this mineral interest when conveying its interests in the land (AS 38.05.125). Accordingly, when state land is conveyed to an individual, local government, or other entity, state law requires that the deed reserve the mineral rights for the state unless there is a prior, valid claim. Furthermore, state law reserves to the state the right to reasonable access to the surface for purposes of exploring for, developing, and producing the reserved mineral.

The Alaska Statehood Act also provided for the United States Submerged Lands Act to apply to Alaska. The Submerged Lands Act of May 22, 1953 states that all lands permanently or periodically covered by tidal waters up to, but not above, the line of mean high tide and seaward to a line three miles from the coast mean low tide line is owned by the state. The Submerged Lands Act sought to return title of submerged lands to the states and promote exploration and development of oil and gas in coastal waters.

### **1. Memorandum of Agreement Between the USDS Forest Service and the State of Alaska, Department of Natural Resources**

On March 31, 1992, DNR and the US Department of Agriculture, Forest Service (USFS) entered into a Memorandum of Agreement (MOA) regarding lands within and adjacent to the License Area in the Chugach and Tongass National Forests. The agencies signed the MOA because of the significant changes to the landscape and shifting of the substrate along the Gulf of Alaska coast and along the coastline of the License Area resulting from the 1964 Great Alaska Earthquake. Lands

were uplifted to become uplands that were once submerged tidelands within the License Area during and following the massive earthquake.

In the MOA, USFS has management responsibility over lands that are above the current mean high tide line, and DNR manages lands that are below the mean high tide line. In the License Area, these coastal lands are generally uplifted lands that were previously state-owned submerged lands granting management responsibility for those lands to USFS. The agreement requires that the agencies will notify each other before making commitments to land uses in excess of two years and will require concurrence for the commitment of land uses over ten years until USFS and DNR reach a longer-term resolution or otherwise terminate the agreement (USFS and DNR 1992). This exploration license contains approximately 4,822 acres of the coastal lands defined in the MOA. The award of this acreage is pending the state acquiring quiet title to those lands. If the title is acquired, then that acreage could become part of the License Area. In a September 25, 2019 letter in response to the preliminary written finding, USFS requested that the coastal lands be excluded from the License Area. At this time, state-owned uplands that are managed by USFS are not available for oil and gas exploration. Figure 3.3 depicts the coastal lands that are currently managed by USFS.

## **2. Bering River-Controller Bay Trumpeter Swan Management Area Cooperative Agreement**

The Bering River-Controller Bay Trumpeter Swan Management Area overlaps the License Area. On October 19, 1976, DNR entered into a cooperative agreement with the USFS; US Department of the Interior, Fish and Wildlife Service (USFWS); and the Alaska Department of Fish and Game (ADF&G). The agreement's purpose is to facilitate cooperation in developing, managing, and maintaining the exceptional fish and wildlife and their habitat in the Bering River-Controller Bay area according to the principles of multiple use for the best interest of the State of Alaska and the United States of America.

In the cooperative agreement DNR agreed:

- To prevent or mitigate damage, disturbance, deterioration, or misuse of waterfowl, fish, or other wildlife and their habitat on the state-owned lands of the area. Other tideland uses will be coordinated with the primary resource value of the area.
- To recommend classification of state-owned tidelands of the area below mean high tide as critical habitat.

All of the participating agencies agreed:

- To recognize fish and wildlife and their habitat as the primary resource for the area.
- That all agencies will jointly agree upon an access policy to the area.
- That the parties to this agreement will consult with each other prior to the issuance of any lease or permits for oil or mineral explorations and development, commercial development, road construction, or other uses not specifically dealt with elsewhere in this agreement (USFS et al. 1976).

Figure 3.4 depicts the boundaries of the Bering River-Controller Bay Trumpeter Swan Management Area.

### **3. Copper River Delta Fish and Wildlife Memorandum of Understanding**

The Copper River Delta Fish and Wildlife Management Area (CRDFWMA) overlaps the License Area. In October 1986, DNR entered into a Memorandum of Understanding (MOU) with the USFS; US Department of the Interior, Bureau of Land Management (BLM); USFWS; and ADF&G. The MOU identifies the increasing need to coordinate resources planning and policy development for the lands, waters, and fish and wildlife of the CRDFWMA. It states that it is the mutual desire of the agencies to cooperate in protecting, developing, maintaining and managing the diverse fish and wildlife and their habitat in the CRDFWMA for the best interest of the State of Alaska and the United States of America.

In the MOU DNR agreed:

- To administer state lands within the Copper River Delta State CHA consistent with the state legislature's intent for those lands
- To manage lands with the area encompassed by the Bering River-Controller Bay Cooperative Agreement consistent with that agreement and consider fish and wildlife values when making permit, lease or other disposal decisions on state lands within the CRDFWMA.
- To take appropriate measures consistent with current authority and to develop, where appropriate, additional measures to prevent or mitigate significant damage, disturbance, deterioration, or misuse of waterfowl, fish, or other wildlife and their habitat on lands administered by the state within the area through the Prince William Sound area planning process.
- To assist ADF&G in monitoring land use activities within the Copper River Delta CHA and report and unauthorized land uses promptly to ADF&G.
- To assist ADF&G during the development of a management plan for the Copper River Delta CHA.
- Parties to the MOU will consult with each other before the issuance of leases for oil or permits for mineral explorations, or other resource development activities consistent with regulations in place at the time of the action (USFS et al. 1986).

DNR met with the participating agencies to gather mitigation measure recommendations and other input in this exploration licensing review process on October 25, 2016. Several mitigation measures that were discussed in that meeting have been incorporated into this Final Written Finding and are included in Chapter Nine, Mitigation Measures. Other information provided and some suggestions outside the scope of mitigation measures have been incorporated into Chapter Seven Governmental Powers to Regulate Oil and Gas.

Figure 3.5 depicts the boundaries of the CRDFWMA. The Copper River Delta CHA is shown on Figure 3.1 and Figure 3.2.

#### **4. Alaska Native Claims Settlement Act**

The Alaska Native Claims Settlement Act (ANCSA), passed by Congress in 1971, also granted newly created regional Native corporations the right to select and obtain the land and mineral estates within the regional Native corporation boundaries from the federal domain. It also allowed Native village corporations and individual Alaskan Natives to receive land estate interests. However, overlapping selections created conflicts and delays in conveying the land from the federal government, and some selected lands have yet to be conveyed. Native-owned lands are present adjacent to the License Area in uplands along the shores of Controller Bay.

Titles conveyed under ANCSA and the Alaska Native Allotment Act are held in restricted status, and the surface estate cannot be alienated or encumbered without approval from the Bureau of Indian Affairs (BIA) (43 CFR 2561.3). However, some allottees have successfully applied to the BIA to have the restrictions removed and were issued a patent in fee which vested all management authority in the allottee. Should lands wherein the surface is owned by an entity other than the state be offered and licensed or leased by the State of Alaska, rights to exploration and development of the oil and gas resources may not be exercised until the licensees make provisions to compensate the landowner for full payment for all damages sustained by the owner, by reason of entering upon the land, as required by the license, subsequent leases and AS 38.05.130 as applicable. Mineral closing orders, which are commonly associated with surface land disposal, do not apply to oil and gas leasing.



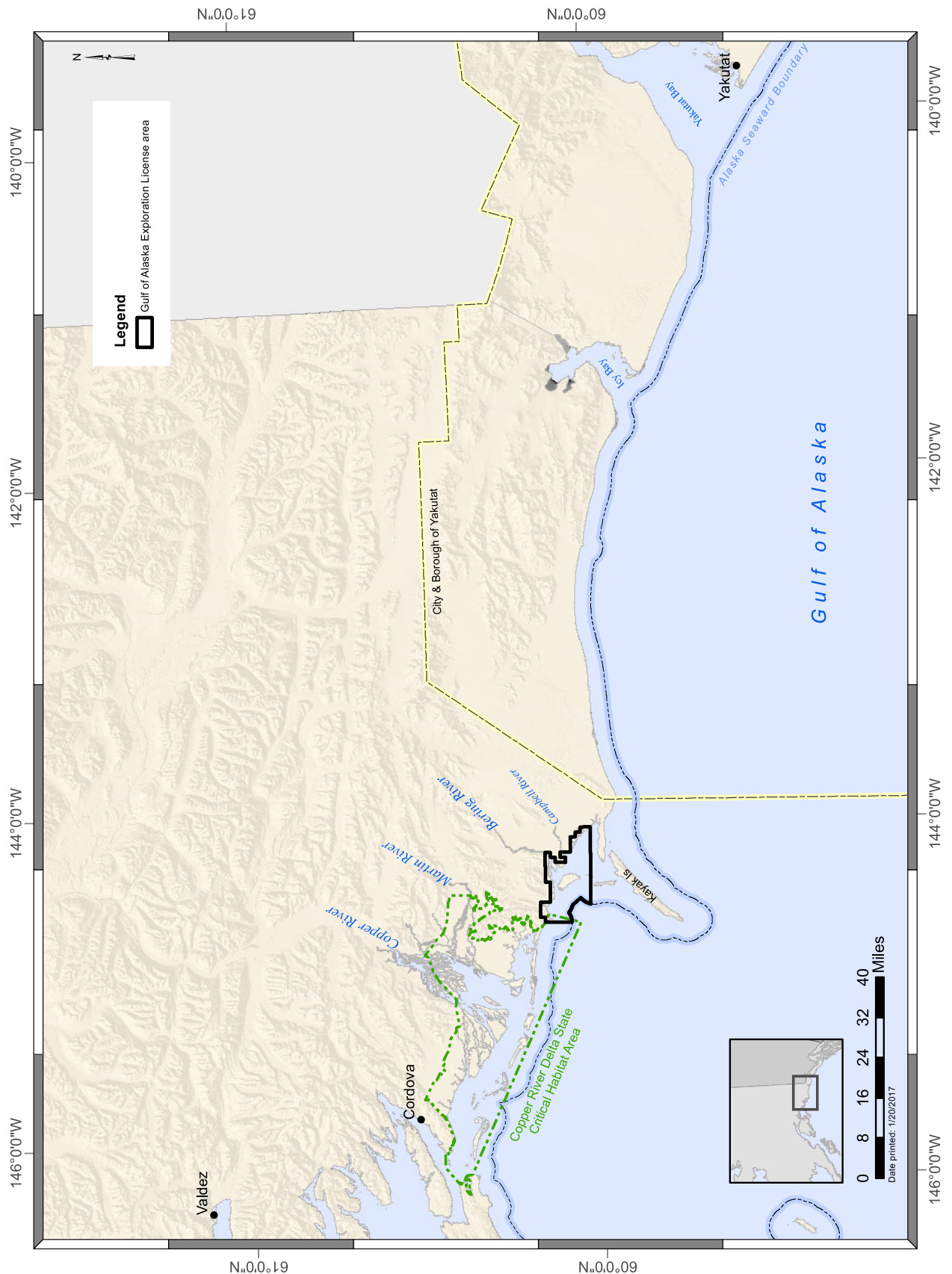


Figure 3.1. Gulf of Alaska Area Map

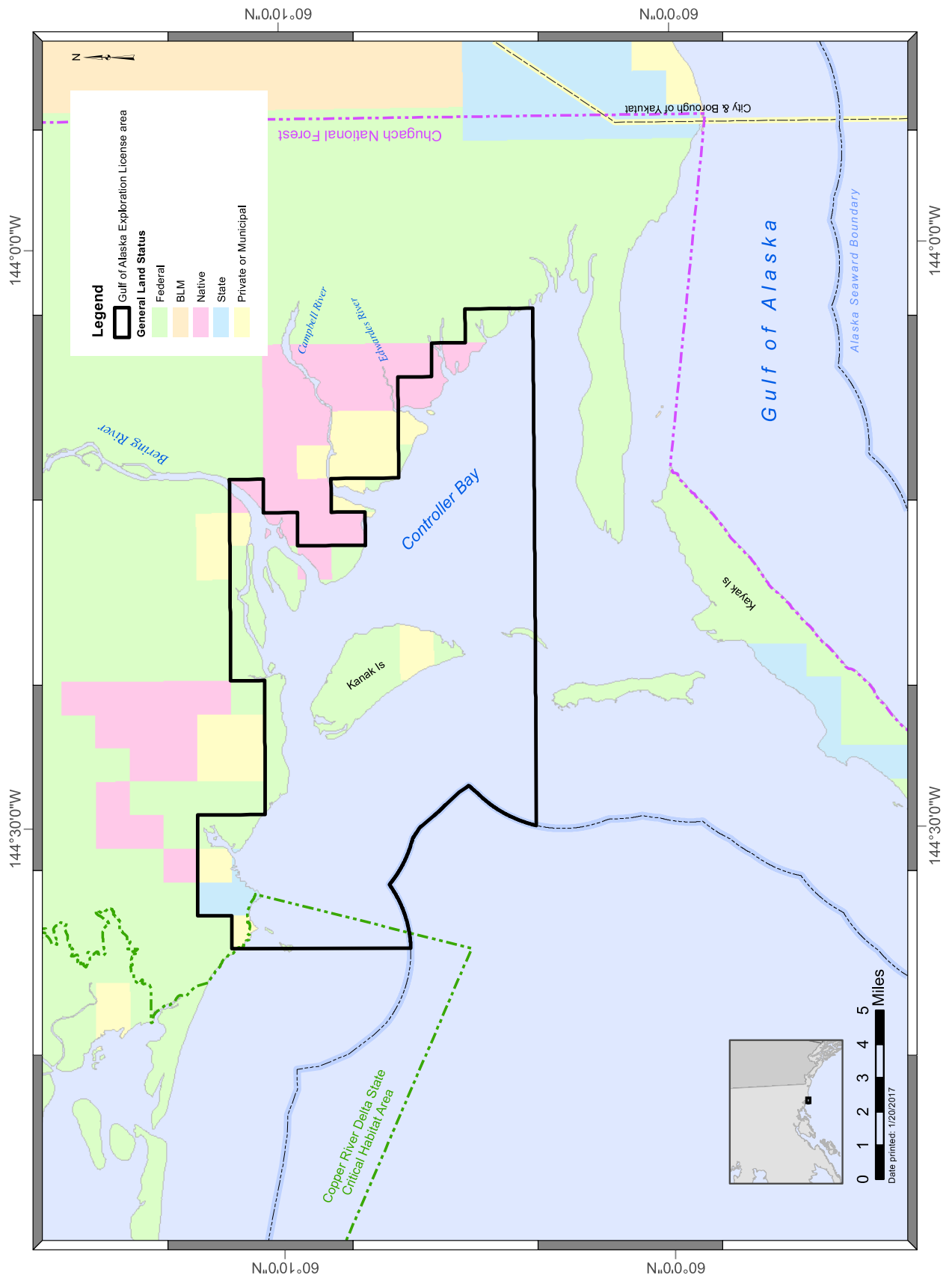


Figure 3.2. Gulf of Alaska Land Status Map

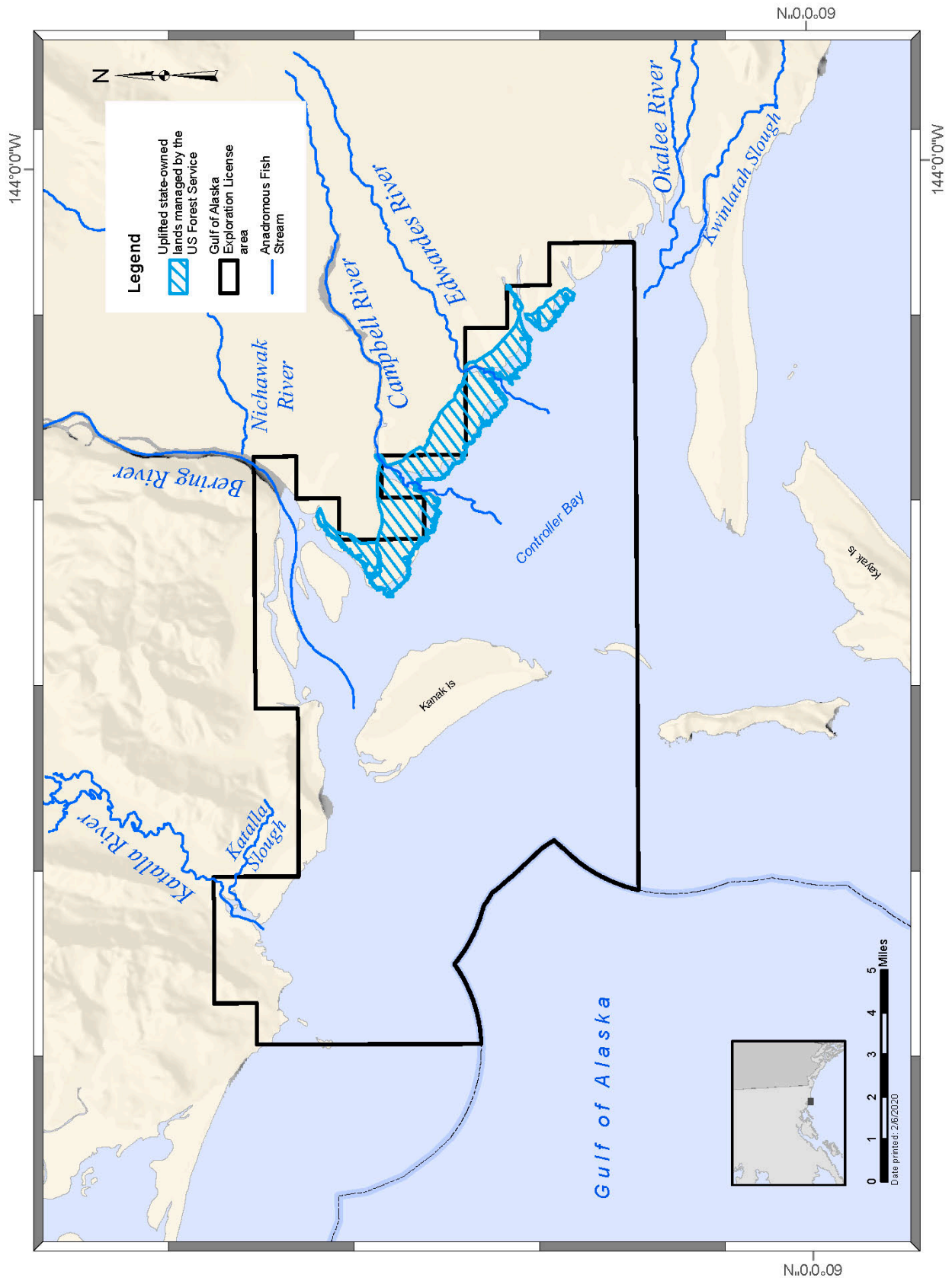


Figure 3.3. Coastal Uplift Lands Managed by US Forest Service Map



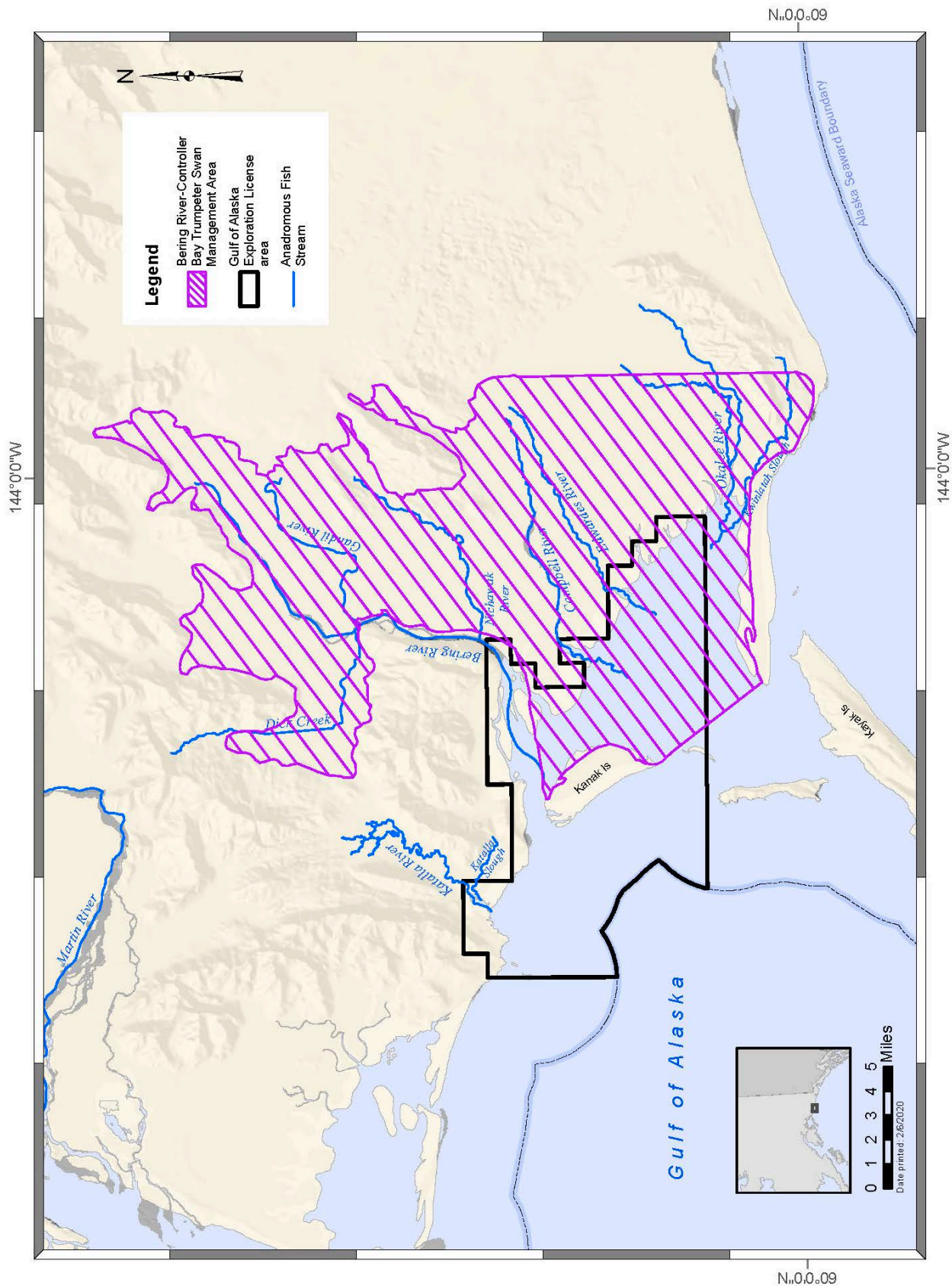


Figure 3.4. Bering River-Controller Bay Trumpeter Swan Management Area Map

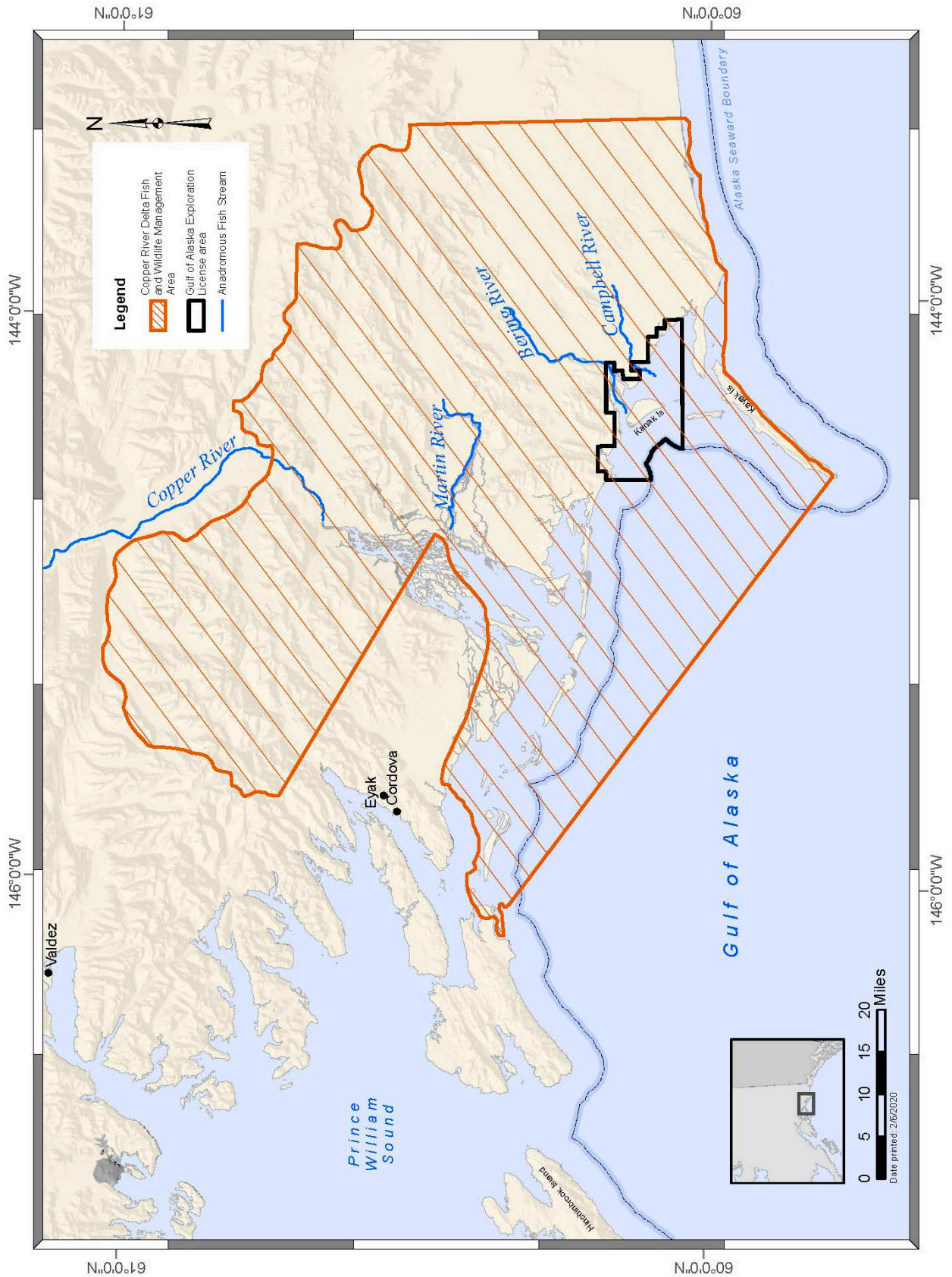


Figure 3.5. Copper River Delta Fish and Wildlife Management Area Map



## C. History and Cultural Resources

Historic and cultural resources can include a range of sites, deposits, structures, ruins, buildings, graves, artifacts, fossils, and objects of antiquity that provide information pertaining to the historical or prehistoric culture of people in the state, as well as to the natural history of the state.

The Alaska Heritage Resources Survey database indicates there are cultural resource sites within the License Area. Only a small portion of the state has been surveyed for cultural resources and previously unidentified resources may be located within the License Area. Specific historical accounts for the License Area are unknown, therefore, historical context for the License Area, in general, is provided (AHRs 2018b).

The Alaska Heritage Resources Survey database indicates that there are 126 reported cultural resource sites within the solicitation area for this license and 21 reported cultural resource sites within the License Area. The resource types include paleontological sites, prehistoric sites, Russian-era occupation sites, and early 20th century era sites (AHRs 2018a).

Archaeological records show the Controller Bay area was inhabited approximately 6,000 years ago. The area defines the boundary for several different Alaska Native cultures. The Eskimo or Alutiiq from the west, the Athabaskan natives from the interior and the Tlinkit from the southeast all have the extents of their territories near the License Area. In 1741, Russian explorer Vitus Bering arrived in Controller Bay on Kayak Island with naturalist Georg Steller and they were the first Europeans known to encounter the coastal region near the License Area (Katalla 2018). Captain James Cook also landed on the northwest tip of Kayak Island in 1778, a few miles south of where Steller and Bering landed. The Bering Steller Land Site has been declared a National Landmark and is sometimes referred to as the Plymouth Rock of Alaska (DNR 1988).

Throughout the maritime history of the Gulf of Alaska, numerous shipwrecks occurred; the highest density of which were within 50 nautical miles of shore and at depths of 650 feet and greater. Dozens of shipwrecks have been documented along the coastline and within the 12-mile nautical limit from Cape Yakataga to and around Prince William Sound; there are two documented shipwrecks just south of the License Area boundary (US Navy 2011; NOAA 2020).

In September 1902, the Alaska Development Company, also known as the English Co., discovered commercial quantities of oil at Katalla. The New York Times reported the discovery of oil at Katalla, and stated that the Alaska Steam Coal and Petroleum Company had struck a gusher of oil spewing 200 feet into the air (Katalla 2018). With word of the discovery in the national news, the population of Katalla expanded to 5,000 people by 1908 (Brown 2016).

Between 1902 and 1931, there were 28 oil wells drilled in the Katalla oil field and 44 wells drilled in the area (AOGCC 2005, 2016). Initially, oil was stored in pits dug into the ground; storage tanks were constructed subsequently (Katalla 2018). In total, 154,000 barrels of oil were produced and refined in a small refinery that was completed in 1911 at the Katalla oil field until it burned down in 1933 (AOGCC 2005, 2016). The refinery was never rebuilt, and people began leaving the area. Katalla's post office closed in 1943 as the area became a ghost town. The site of the former Chilkat Oil Company refinery was named to the National Register of Historic Places in 1974 (Brown 2016).

## **D. Local Communities**

There are no communities within the License Area and the License Area does not coincide with any borough boundaries. The City of Cordova, located approximately 40 miles west of the License Area's western boundary, is the closest community (Figure 3.1). Anchorage is located approximately 175 miles and Tatitlek is located approximately 90 miles northwest of the License Area. Chenega Bay is located approximately 120 miles west of the License Area. Other towns in the broad vicinity of the License Area include Valdez and Yakutat (Figure 3.1).

### **1. Cordova**

Cordova is a home rule city 150 miles southeast of Anchorage at the southeastern edge of Prince William Sound. In 2017, it had a population of 2,279. Between 2000 and 2010, the population increased 8 percent (DCCED 2018). Since 2010, it has increased another 2 percent. Cordova's population in 2010 was 70.3 percent Caucasian, 10.9 percent Asian, 8.8 percent American Indian or Alaska Native, and about 9 percent identified themselves as multiracial (DCCED 2018).

In 2016, about 29 percent of the Cordova workforce was employed in state and local government, 20 percent worked in trade, transportation, and utilities, 16 percent worked in manufacturing, 10 percent worked in professional and business services, and 6 percent worked in leisure and hospitality (DOLWD 2018).

Cordova supports a large fishing fleet for Prince William Sound and the Copper River delta and there are six onshore fish processing plants (City of Cordova 2018). In 2017, 337 residents held commercial fishing permits. Between 2010 and 2014, the estimated per capita income was \$39,828, median household income was \$93,750, and median family income was \$117,793. In 2017, about 2.4 percent of the population was below the poverty level (DCCED 2018).

The city's power is supplied by the Cordova Electric Cooperative. In 2015, the residential rate was \$0.2217 per kWh if using more than 500 kWh per month (Cordova Electric Cooperative 2019).

Cordova is accessible by plane or boat, is linked to the North Pacific Ocean shipping lanes through the Gulf of Alaska and receives barge and state ferry services all year (City of Cordova 2018).

There is a state operated airport with a 7,500-foot asphalt runway and 1,899-foot gravel crosswind runway. The Cordova Municipal Airport, which is owned by the state and operated by the city, has an 1,800-foot gravel runway. There is also a private airstrip owned by Eyak Corporation. Daily scheduled jet flights and air taxis are available. Float planes land at the Lake Eyak seaplane base or at the boat harbor (DCCED 2018).

The City of Cordova operates the port, which includes three large docks. Harbor facilities include a small boat harbor that can accommodate 727 vessels, two launch ramps, a boat haul-out, a 150-ton travel lift, and a shipyard with marine repair services (City of Cordova 2018). A 48-mile gravel road provides access to the Copper River delta to the east (DCCED 2018).

Cordova has a city school district with an elementary school, an alternative school for kindergarten through twelfth grade, and a combined middle and high school. In 2017, 329 students attended school. There is a community medical center, a volunteer fire department with emergency medical

and ambulance services, a recreation center, and swimming pool (DCCED 2018). The federally recognized tribe Native Village of Eyak is based in Cordova. The tribe operates a community health center, a cultural center, and provides social services to tribal members (Eyak 2016).

## **2. Chenega**

Chenega, also known as Chenega Bay, is an unincorporated town in southwest Prince William Sound, 104 air miles southeast of Anchorage, and approximately 120 miles west of the License Area. In 2017, Chenega Bay had a population of 69 (DCCED 2018).

According to the 2010 census, the population was 52.6 percent American Indian or Alaska Native, 39.5 percent Caucasian, and 7.9 percent multiracial (DOLWD 2018). Between 2000 and 2010, the population declined 3 percent. The Native Village of Chenega is the community's federally recognized tribe (DCCED 2018).

In 2017, about 53 percent of the Chenega Bay workforce was employed in state and local government, 12 percent worked in financial activities, 6 percent in education and health services, 6 percent in natural resources and mining, and 6 percent in professional and business services. Commercial fishing and subsistence activities also contribute to the economy (DOLWD 2018).

Chenega Bay has a small boat harbor and dock. The state maintains a 3,000-foot gravel runway, and there is an area for float plane landings. Chenega Bay is also served by the Alaska Marine Highway Ferry system. The Native Village of Chenega operates the power plant in the village. In 2015, it provided power for \$0.17 per kWh subsidized by the state Power Cost Equalization (PCE) program (DCCED 2018).

There is one school in the community. In 2017, it was attended by 16 students. Primary health care is provided by the Arch Priest Nicholas Kompkoff Clinic. Chenega Bay has a fire department that also provides emergency medical services (DCCED 2018).

## **3. Tatitlek**

Tatitlek is an unincorporated community about 30 miles northwest of Cordova in Prince William Sound, and approximately 90 miles northwest of the License Area. In 2017, it had a population of 93 (DCCED 2018). Its 2010 population was 60.2 percent American Indian or Alaska Native, 30.7 percent Caucasian, 5.7 percent multiracial, 1.1 percent Asian, and 1.1 percent Pacific Islander (DOLWD 2018).

In 2017, about 62 percent of the Tatitlek workforce was employed in local government, 9.5 percent in professional and business services, and 9.5 percent in trade, transportation, and utilities, (DOLWD 2018). One resident held a commercial fishing permit. Between 2010 and 2014, the estimated per capita income was \$25,738, median household income was \$35,833, and median family income was \$40,000. In 2017, about 16 percent of the population was below the poverty level (DCCED 2018).

The Tatitlek Indian Reorganization Act Village Council operates the Tatitlek Electric Utility. In 2017, it provided power for \$0.34 per kWh with a state subsidy. There is one school located in the



community. In 2017, it was attended by 17 students. The Tatitlek Clinic provides basic health care. The state maintains an airport with one 3,700-foot runway. The community is also served by the Alaska Marine Highway Ferry system (DCCED 2018).

#### **4. Valdez**

Valdez is a home rule city about 300 road miles east of Anchorage, and approximately 95 air miles northwest of the License Area. In 2017, Valdez had a population of 3,937. Valdez is on the north shore of Port Valdez, a deep-water fjord in Prince William Sound (DCCED 2018). In 2016, about 81.5 percent of the population is Caucasian, 8.2 percent American Indian or Alaska Native, 6.3 percent multiracial, and 1.9 percent Asian (DOLWD 2018).

The Valdez economy was transformed in the late 1970s when the city was selected to be the terminus for the Trans-Alaska Pipeline. The population boomed with construction of the marine terminal and, after it was built, the city's population settled to levels six to eight times what it had historically been before the pipeline. Valdez has the second-highest municipal tax base in the state because of its position as the southern terminus and offloading point for the Trans-Alaska Pipeline System (DCCED 2018).

In 2017, 90 percent of the local tax revenues come from the Valdez marine terminal, Petro Star's Valdez refinery, and other TAPS pipeline facilities. Approximately 440 employees of the refinery, Alyeska Pipeline or the Marine Terminal, and oil and gas support service company employees live in Valdez (McDowell Group 2017). Two fish processing plants operate in Valdez. In addition, the Valdez Fisheries Development Association operates the Valdez Fish Hatchery all year and a processing plant during fishing season. Several cruise ships dock in Valdez each year (DCCED 2018).

In 2017, about 22 percent of Valdez jobs were in state and local government, 27 percent of the jobs were in transportation, trade, and utilities, 12 percent worked in education and health services, 11 percent worked in leisure and hospitality, 8 percent of the workforce was in manufacturing and construction, and 6 percent worked in natural resources and mining (DOLWD 2018). In 2017, there were 33 commercial fishing permits in Valdez. Between 2009 and 2013, the estimated per capita income between 2010 and 2014 was \$35,032, median household income was \$99,973, and median family income was \$101,786. In 2017, about 8 percent of the population lived below the poverty level (DCCED 2018).

Valdez is connected to the state road system by the Richardson Highway and is also on the Alaska Marine Highway System. There is a state airport with a 6,500-foot paved runway, a floatplane lake northwest of town, and two heliports. The harbor is ice free all year (DCCED 2018).

Valdez has a small boat harbor with 511 slips, vessel maintenance facilities, and a boat yard with a 75-ton travel lift and an all tide launching ramp (City of Valdez 2018). The Alyeska Pipeline Service Company owns and operates the Valdez Marine Terminal, which is the end of the Trans-Alaska Pipeline and occupies more than 1,000 acres of land. There are 14 storage tanks in service, facilities to measure the incoming oil, two functional loading berths, and a power plant at the terminal (Alyeska Pipeline Service Company 2018).

The City of Valdez operates a municipal water supply system that draws from four wells and is stored in reservoirs and a sewage treatment plant. The city has a Class II municipal landfill with an oil and hazardous waste recycling center (City of Valdez 2018). Power is provided by the Copper Valley Electric Authority from the Solomon Gulch Hydroelectric Project and from a cogeneration plant built with Petro Star, which runs an oil refinery in Valdez. In 2017, the residential cost of power in Valdez was \$0.28 per kWh (DCCED 2018).

Other municipal services include a library, museum, civic center, police, fire and emergency medical services. There is a hospital and mental health services available in Valdez. There is a city school district with three schools and one correspondence school. In 2017, there were 654 students among the four schools (DCCED 2018).

## **5. City and Borough of Yakutat**

Yakutat is a home rule borough 220 miles southeast of Cordova, and approximately 165 air miles east southeast of the License Area. In 2017, it had a population of 552 people (DCCED 2018). The City of Yakutat is on the Gulf of Alaska at the mouth of Yakutat Bay. According to the 2010 census, Yakutat's population was 42.4 percent Caucasian, 35.8 percent American Indian or Alaska Native, 15.4 percent multiracial, 4.1 percent Asian, and 1.8 percent Pacific Islander. (DOLWD 2018).

In 2016, about 47 percent of the working population was employed in state and local government, 16 percent worked in trade, transportation, and utilities, 13 percent worked in leisure and hospitality, and 8 percent worked in manufacturing (DOLWD 2018). Between 2010 and 2014, the estimated per capita income was \$33,475, median household income was \$69,306, and median family income was \$76,000. In 2016, about 4 percent of the population was below the poverty level (DCCED 2018).

Yakutat is accessible by air and water. There are scheduled jet flights, air taxis and float plane services to Yakutat. The state maintains two runways large enough to accommodate jets. The US Forest Service owns five airstrips in the vicinity, and the National Park Service operates one airstrip at East Alsek River (DCCED 2018).

The City and Borough of Yakutat operates a public water system, a power system, and the landfill. Water is treated and piped to all homes and schools in the community. A private firm collects refuse, and the borough operates an unpermitted landfill. Barges deliver goods monthly during the winter, and more frequently in summer. Yakutat is on the Alaska Marine Highway Ferry system. The borough operates the small boat harbor, which has a dedicated seaplane float (DCCED 2018).

There is one public school and one correspondence school in Yakutat. In 2017, a total of 93 students attended both schools through 12th grade. Emergency medical service is provided by volunteers. The federally recognized Yakutat Tlingit Tribe and the Yakutat Native Association are based in Yakutat (DCCED 2018).

## **E. Climate**

### **1. Current Conditions**

The License Area falls within a Gulf of Alaska maritime climate zone characterized by persistent rain and fog, long cold winters, and mild summers; although lower altitudes do not experience long periods of freezing weather. The climate of the Gulf of Alaska is influenced by the Aleutian low, a semi-permanent low-pressure center in the northern Gulf of Alaska, that controls atmospheric circulation in the region. The Aleutian low generates storms and migratory lows and is most active in late fall to spring. The North Pacific high-pressure system, centered in the northeast Pacific Ocean, dominates summer weather in the Gulf of Alaska when the Aleutian low is weaker leading to cool summers. Interannual, interdecadal, or longer-term climate variability is influenced by the potentially interrelated Pacific Decadal Oscillation, Pacific-North American Pattern, El Niño/Southern Oscillation, and Arctic Oscillation. Coastal areas receive abundant precipitation that flows back to the ocean because of the steep topography. This influx of freshwater drives the Alaska Current and the Alaska Coastal Current that transport warm waters from the south along the Alaska coast (Mix et al. 2003).

Normal mean annual temperature and precipitation in the License Area range between 40 and 43 °F and 90 and 155 inches (Table 3-1). June, July, and August generally average around 50 °F with the highest monthly mean precipitation near the coast of about 20 inches in September and October (Table 3-1). Multiple commenters noted the harsh weather and sea conditions in coastal waters of the License Area especially during fall and winter (see Appendix A). Wind speed and direction data are available from sensors at Strawberry Reef, Cape Saint Elias, and a data buoy off Cape Suckling (AOOS 2020). Wave height data are available from the Cape Suckling data buoy (AOOS 2020). Kayak Island and Okalee Spit provide some protection from wind and waves in the License Area. Generally, winds are calmer at Strawberry Reef, just west of the License Area, during April to October; with mean, 75<sup>th</sup> percentile, and maximum wind speed roughly doubling during November to March (Table 3-2). Winds at Strawberry Reef are predominately from the North (Figure 3.6). Winds are considerably stronger at Cape Saint Elias and remain more consistent throughout the year, with maximum winds under 30 knots occurring during May to August (Table 3-2). Winds at Cape Saint Elias are predominately from the east southeast (Figure 3.6). Offshore of Cape Suckling in the Gulf of Alaska winds are stronger, appear to calm somewhat during June, July, and August, and reach maximum speeds over 40 knots during October to January (Table 3-2). Winds offshore of Cape Suckling are predominately from the east (Figure 3.6). Mean offshore wave heights of 5 feet or less occur during June, July, and August, with maximum wave heights of 30 feet or more during December, January, and February (Table 3-2).

**Table 3-1. Temperature (°F) and precipitation (inch) 1981–2010 normal means for stations near the License Area.**

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<b>Cordova North</b>													
Minimum Temp	27.9	28.1	29.4	33.8	40.5	46.9	51.1	50.8	45.3	37.4	31.0	29.5	37.7
Mean Temp	32.4	32.6	34.4	39.4	46.7	52.5	56.2	55.9	50.2	41.9	35.3	33.8	42.7
Maximum Temp	36.9	37.1	39.3	45.0	52.8	58.1	61.3	60.9	55.1	46.5	39.5	38.0	47.6
Mean Precip	12.5	11.6	9.3	8.6	8.1	6.5	7.6	13.5	21.6	20.0	12.4	16.7	148.4
<b>Cordova M. K. Smith Airport</b>													
Minimum Temp	19.4	20.7	23.0	29.5	36.8	43.4	47.5	46.0	40.1	32.5	23.5	21.9	32.1
Mean Temp	26.5	28.3	31.2	37.9	45.4	51.2	54.4	53.9	48.1	39.7	30.4	28.4	39.7
Maximum Temp	33.6	35.9	39.4	46.4	54.0	59.0	61.3	61.7	56.2	46.9	37.3	34.8	47.3
Mean Precip	7.1	6.1	5.3	4.6	5.5	4.9	5.7	10.0	13.6	11.3	7.0	9.3	90.4
<b>Yakutat State Airport</b>													
Minimum Temp	22.4	23.0	24.6	29.9	37.2	44.3	48.6	47.2	41.2	34.7	26.3	24.3	33.7
Mean Temp	28.1	29.7	32.0	37.8	44.7	50.8	54.3	53.8	48.4	41.0	32.3	29.6	40.3
Maximum Temp	33.8	36.3	39.4	45.7	52.3	57.3	60.1	60.5	55.6	47.4	38.4	35.0	46.9
Mean Precip	13.7	10.9	11.0	9.2	8.2	6.4	7.9	14.1	21.1	22.0	14.4	16.3	155.1

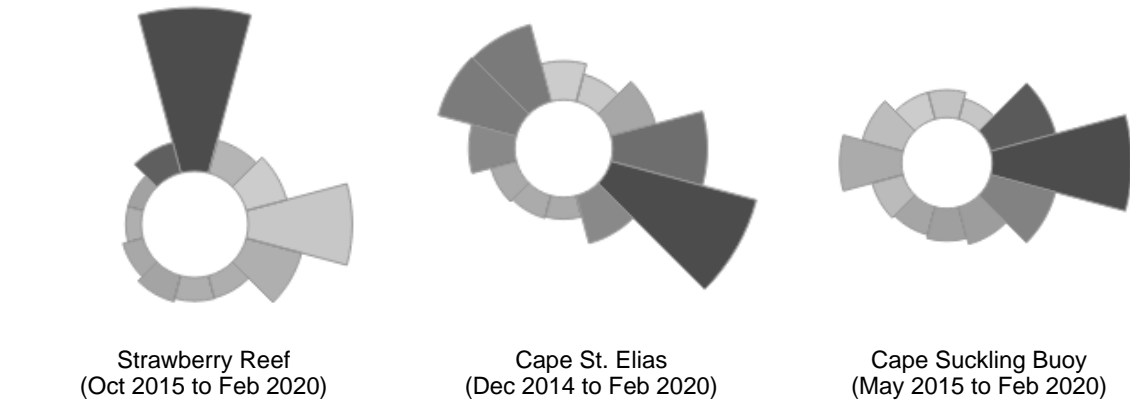
Source: Western Region Climate Center (WRCC 2020)

**Table 3-2. Wind speeds (knots) and wave heights (feet) for AOOS stations near the License Area.**

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Strawberry Reef</b>												
25th percentile wind speed	3.9	3.6	3.9	1.9	1.7	1.5	1.5	1.5	1.5	1.9	4.1	2.2
Mean wind speed	7.7	6.9	6.4	3.3	3.0	2.9	2.6	2.7	2.3	3.6	6.6	5.7
75th percentile wind speed	10.8	9.7	8.9	4.1	4.1	3.9	3.7	3.7	3.2	4.8	8.7	8.6
Maximum wind speed	26.9	22.6	25.2	14.8	10.4	11.3	9.6	13.9	11.3	17.4	20.0	22.6
Number of Records	5	5	4	4	4	4	4	4	4	4	5	5
<b>Cape Saint Elias</b>												
25th percentile wind speed	2.3	2.2	1.8	2.7	3.6	2.8	2.9	2.5	2.2	2.2	2.2	2.4
Mean wind speed	7.0	6.6	6.4	6.9	7.3	6.0	5.9	5.9	5.7	6.4	6.8	6.8
75th percentile wind speed	10.3	9.7	9.5	10.0	10.4	8.4	8.3	8.5	7.9	9.1	10.0	9.6
Maximum wind speed	36.8	34.2	31.4	35.8	29.1	26.2	26.9	28.9	33.6	38.5	39.2	41.1
Number of Records	6	6	5	5	5	5	5	5	5	5	5	6
<b>Cape Suckling Offshore Buoy – Wind</b>												
25th percentile wind speed	7.9	9.7	–	–	7.8	5.8	4.9	4.9	5.8	7.3	7.8	10.2
Mean wind speed	15.5	16.3	–	–	13.3	9.9	9.1	8.8	10.9	14.4	14.7	17.4
75th percentile wind speed	20.5	23.3	–	–	15.6	13.6	12.6	11.7	14.1	19.4	20.2	23.8
Maximum wind speed	40.8	38.9	–	–	33.0	38.9	29.2	33.0	38.9	42.8	42.8	44.7
Number of Records	4	1	0	0	1	1	2	2	4	4	4	4
<b>Cape Suckling Offshore Buoy – Waves</b>												
25th percentile wave height	6.3	5.9	3.4	4.8	4.0	2.7	3.1	3.4	4.0	5.7	5.5	7.6

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean wave height	9.6	8.9	7.1	7.3	5.8	4.4	3.9	5.1	5.9	8.8	9.0	11.4
75th percentile wave height	12.2	10.8	9.5	9.0	7.0	5.5	4.4	5.9	7.4	11.2	11.6	14.4
Maximum wave height	30.5	29.9	25.8	20.3	15.4	19.0	10.3	15.6	20.0	29.0	26.9	33.5
Number of Records	4	4	2	2	3	3	3	3	4	4	4	4

Notes: knot = nautical mile per hour; AOOS = Alaska Ocean Observing System; – = no data  
Source: (AOOS 2020)



Source: Alaska Ocean Observing System (AOOS 2020)

**Figure 3.6. Predominant wind from direction for AOOS stations near the License Area.**

## 2. Climate Change

The average global temperature, an average over the entire surface of the planet, has increased by about 2 °F since 1880 increasing at a rate of about 0.27 to 0.36 °F per decade, with two-thirds of the warming occurring since 1975 (Carlowicz 2020). Global temperature depends on the amount of energy received From the sun and the amount of energy radiated back into space. The amount of energy radiated by the earth depends on the chemical composition of the atmosphere, particularly the amount of heat-trapping greenhouse gases. Unlike global temperature, local or regional temperatures fluctuate substantially due to predictable cyclical events, like night and day, summer and winter, and variable, sometimes hard-to-predict, wind and precipitation patterns (Carlowicz 2020).

Temperatures are increasing in Alaska more rapidly than in other parts of the United States, making Alaska a forefront for climate change. The mean annual temperature change in Alaska from 1949 to 2018 follows an increasing linear trend of 4.0 °F, and 2.8 °F from 1976 to 2018. Seasonal mean temperature increases were greatest in winter and spring from 1949 to 2018, and in fall from 1976 to 2018. Mean annual temperatures for 2019 around the northern Gulf of Alaska coast at Yakutat and Kodiak were 3.6 and 4.5 °F above 1981 to 2010 normal temperatures (ACRC 2019b). Precipitation has also increased throughout the state over the past 50 years with the annual trend from 1969 to 2018 in the License Area an increase of nearly 10 percent. Based on year-to-year variability, however, southeast Alaska reached the lowest precipitation values on record during 2017 to 2019 (Thoman and Walsh 2019). The northeast Gulf was drier than normal, with below

average snowfall totals during the 2018/2019 winter season contributing to significant drought conditions in the southeast (ACRC 2019b).

Climate projections predict increasing storm intensities in Alaska, although south coastal areas apparently do not have the same potential for negative effects from storm surges and increased waves and wind that has resulted in significant coastal erosion for villages in northwestern Alaska (Haufler et al. 2010). Despite these projections, there has been an overall decline in September to November storm frequency, duration, and wind intensity over the past 40 years, and winter storminess has shown no clear trend since 1990 (Thoman and Walsh 2019).

A new blob of warm water called the Northeast Pacific Marine Heatwave of 2019 formed in the Gulf of Alaska during May and reached its maximum size in August. A similar 2014–2016 warm water blob in the Gulf of Alaska has been linked to multiple fishery disasters, young California sea lions stranding on beaches, the largest harmful algal bloom recorded on the West Coast, massive common murre die-offs, and a lower than expected 2018 sockeye run for the Copper River (ACRC 2019a; Piatt et al. 2020). Smolts contributing to the 2018 Copper River salmon spawning run would have entered colder than normal nearshore waters as they swam out to sea from their estuaries which may have slowed their growth. Nearshore waters are typically colder when the Gulf is warm (ACRC 2019a). The prolonged heatwave reduced phytoplankton biomass and shifted zooplankton communities toward lower-calorie species reducing forage fish quality and quantity which may have reduced prey abundance for juvenile sockeye further diminishing sockeye abundance (ACRC 2019a; Piatt et al. 2020).

Effects of climate change of concern for the License Area include: increasing ocean temperatures, changing ocean circulation patterns, ocean acidification, changes to stream temperatures and flows, loss of glaciers, and increases in invasive plants and animals (Haufler et al. 2010; Markon et al. 2018). These changes are projected to have negative and positive effects on the region's fisheries (Mathis et al. 2015; Johnson 2016). Invasive species, harmful algal blooms, and pathogens have become more common and have harmed fish and shellfish; commercial fish stocks are undergoing changes in distribution, abundance, and behaviors; most salmon stocks probably will continue to prosper and some may expand their range; halibut biomass may increase; and Pacific cod and some flatfish may expand their range or increase in abundance (Johnson 2016). A risk assessment that evaluated global ocean model hindcasts and projections of ocean chemistry, fisheries harvest data for shellfish, salmon and other finfish, and demographic information found that southeast and southwest Alaska communities that are highly reliant on fishery harvests and have relatively lower incomes and employment alternatives likely face the highest risk from ocean acidification. The risk of ocean acidification to fisheries systems in the License Area is considered high, ranking in the top quarter (7 of 29) of the census regions evaluated with high ratings for: exposure — the proportion of subsistence harvest from shellfish; sensitivity — the proportion of per capita subsistence harvest weight devoted to shellfish and salmon, and the quantity of subsistence harvests per capita; and hazard — with the largest projected changes in aragonite and calcium carbonate saturation states (Mathis et al. 2015).

## F. Natural Hazards

Natural hazards include geological, meteorological, and other naturally occurring phenomena that may have a negative effect on people or the environment. Natural hazards may impose constraints on oil and gas exploration, development, production, and transportation activities. There are four major categories of natural hazards within the License Area, including earthquakes and faulting; tsunamis; mass wasting and avalanche; and glaciers, icebergs, and glacial outburst flooding.

### 1. Earthquakes and Faulting

Everyday scores of earthquakes register on seismic stations around Alaska. On average since 1900, Alaska has been struck by one earthquake of magnitude 8 or greater every 13 years, one magnitude 7 to 8 earthquake every two years, and six magnitude 6 to 7 earthquakes every year (ASHSC 2018). Between the Queen Charlotte-Fairweather fault system to the east and the Alaska-Aleutian megathrust subduction zone to the west, the Gulf of Alaska is an area of complicated and highly active plate tectonics. There are three primary tectonic plates interacting near the northeastern Gulf of Alaska coast: 1) the Pacific plate, which is being forced beneath the 2) North American plate, and the 3) Yakutat microplate, a terrane stuck to the back of the Pacific plate that is complicating the subduction. The Alaska-Aleutian megathrust fault system is responsible for the second-largest earthquake ever recorded throughout the world (magnitude 9.2, the 1964 Great Alaska earthquake; Freymueller et al. 2008).

The Queen Charlotte-Fairweather fault is a right-lateral strike-slip system that is essentially parallel to and coincident with the Southeast Alaska coastline. The Alaska-Aleutian megathrust (*i.e.*, the subduction zone) extends from the Gulf of Alaska westward for over 2,000 miles towards Russia. A transition fault cuts the ocean floor near the back edge of the Yakutat microplate and connects the Alaska-Aleutian megathrust with the Fairweather fault. The Yakutat terrane is beneath this section of the Gulf of Alaska and measures 372 miles by 124 miles. The Pacific plate moves relative to the North American plate at more than 2 inches per year, and the Yakutat microplate is largely responsible for the rapid growth of mountains at the northeast edge of the Gulf of Alaska (Plafker and Berg 1994).

The Yakataga seismic gap lies between the Queen Charlotte-Fairweather fault and the Alaska-Aleutian trench and is an area with notably less earthquake activity than neighboring regions (Plafker and Berg 1994). This is an area of significant plate convergence, though the details of the faulting are not well understood. In this area there have been only two significant earthquakes, in 1899 and 1979 (Hansen and Combellick 1998). The magnitude 6.9 1979 earthquake caused slight damage in Valdez, Haines, and Juneau; and was felt over a 500,000 square mile area (USGS 2018). The magnitude 8.2 1899 earthquake generated a 32-foot tsunami in Yakutat Bay (Hansen and Combellick 1998). Researchers have noted evidence of right-lateral slip of about 0.6 inches per year north of Cape Yakataga (Wesson et al. 2007), and uplifted terraces inland of Yakutat suggest that significant earthquakes along the Yakataga seismic gap that cause vertical motions that occur every 500 to 1400 years (Hansen and Combellick 1998).

The Queen Charlotte-Fairweather fault system has generated four large earthquakes in the 20th century. One of them, though centered 183 miles south of Yakutat at Chichagof Island, had a total

rupture length of 310 miles. In 1958, another large earthquake with magnitude 7.8 occurred approximately 275 miles farther south, ruptured approximately 217 miles of the fault, and caused lateral displacements up to 21 feet. This earthquake triggered a landslide in Lituya Bay and the largest tsunami wave ever recorded and is discussed in more detail in the tsunami section to follow (Hansen and Combellick 1998). Near Yakutat, between 1893 and 1975, there were five earthquakes with magnitudes ranging from 7.0 to 8.6 and at least 110 smaller earthquakes (Yehle 1979).

The 1964 Great Alaska earthquake's epicenter was approximately 56 miles west of Valdez, and the total rupture area extended down the Alaska-Aleutian megathrust to the southwest edge of Kodiak Island. The massive magnitude 9.2 earthquake caused distributed regional subsidence (down-dropping) and uplift from Kodiak Island to parts of the Copper River delta. The Copper River delta stratigraphy preserves a history of repeated vertical deformation from large earthquakes. Paleoseismic work there identified 9-10 major events over a 5,600-year period suggesting an average recurrence interval of 600-700 years between large events (Koehler and Carver 2018).

The 1964 earthquake caused significant shifting of lands in and around the License Area. Lands that were previously submerged below the high tide line were uplifted causing thousands of acres of submerged lands along the shoreline of the License Area to become uplands. Uplifted areas in Controller Bay rendered the existing channels and harbors to become unusable (Plafker et al. 1969).

## **2. Tsunamis**

The Alaska-Aleutian megathrust has the potential to generate the largest earthquakes in the world and consequently communities on Alaska's Pacific coast are at risk of earthquake induced tsunamis. Large seismic events in the Gulf of Alaska have very high potential to generate local and Pacific-wide tsunamis (Suleimani et al. 2005). Thirteen tsunamis were recorded between 1845 and 1968 along the northern Gulf of Alaska (Yehle 1979).

A large earthquake involving offshore seafloor displacement in the Gulf of Alaska could generate a tsunami large enough to destroy coastal facilities in Alaska and affect communities across the Pacific Ocean. The tsunami created by the 1964 earthquake in Prince William Sound destroyed the city of Valdez and the village of Chenega and caused fatalities on the west coast of the United States, but it did not affect the Gulf of Alaska east of Prince William Sound (Combellick 1993). Extended ruptures of the Yakataga seismic gap, however, could cause tsunamis in the Gulf of Alaska (Shennan et al. 2008).

Other large waves of different origins have been recorded – likely caused by calving glaciers and underwater landslides, both of which can be triggered by large earthquakes or volcanic activity. The world's largest recorded tsunami originated approximately 250 miles southeast of the License Area in Lituya Bay. On July 10, 1958, a magnitude 7.7 earthquake along the Fairweather fault caused a large rockslide at the head of the bay. Over 2-billion cubic feet of rock fell approximately 2,000 feet down into the head of the bay and caused a 1,720-foot-tall wave that scoured the walls of the narrow inlet. The wave poured out of the bay moving 100 miles per hour, and 5 people died as a result of the tsunami (Miller 1960; WSSPC 2018).



### **3. Mass Wasting and Avalanches**

Landslides and slope movement can be caused by geologic factors other than seismic activity. The steep coastal slopes are often susceptible to landslides. The Tongass National Forest landslide inventory documents hundreds of landslides in southeast Alaska. The Alaska Department of Transportation has documented a number of landslides near Cordova as well (ADOT 2018; USDA Forest Service 2018). The continental shelf of the Gulf of Alaska seafloor has numerous areas of unstable sediment and large submarine slides south of Icy Bay and west of Kayak Island were likely triggered by earthquakes. Surface or near-surface faults have been identified south of Cape Yakataga and parallel to the southeastern shore of Kayak Island (Combellick 1993).

Snow avalanche conditions generally occur in steep terrain, with high winds and heavy snow loading contributing to their development. Snow avalanches can be released by a high and rapid rate of precipitation, which can influence the balance between stress and strength of the snowpack, by wind transporting snow to a slope, and by changes in air temperature, which can affect snow stability (Schweizer et al. 2003). Once snow conditions are in place avalanches can also be triggered by nearby earthquakes or volcanoes (Combellick 1993).

### **4. Glaciers, Icebergs, and Outburst Flooding**

Icebergs and glacial outburst flooding have occurred in the Gulf of Alaska area. Between 1980 and 1992, the Columbia Glacier in Prince William Sound has retreated 6 miles, producing large numbers of icebergs that have created a navigational hazard. More than 700 tankers move through Prince William Sound annually, often at night and in reduced visibility. In 1994, an empty oil tanker hit an iceberg that gouged a hole 20 feet wide in the ship. If the Columbia Glacier continues its retreat, at some point it will no longer be in tidewater and will cease calving into the sound; however, several other calving glaciers have entered the fjord (Tangborn and Post 1998; Krimmel 1996).

A Prince William Sound risk assessment in the mid-1990s identified icebergs in tanker lanes as among the most significant risks to crude oil tankers. A later study estimated the volume of icebergs calving from Columbia Glacier had increased fivefold and that the trend was likely to continue or intensify (Merrick et al. 2002).

Outburst floods occur when a body of water held back by a glacier is suddenly released. Areas affected by outburst flooding are subjected to serious damage. Wide flood plains are inundated to unusual depths and the high rate of discharge produces rapid erosion, deposition, and changes in the stream channel. The Bering, Yakataga and White River glaciers all impound lakes with the potential to drain catastrophically as the physical characteristics of the glaciers change. The White and Yakataga rivers are to the southeast of the License Area. The Bering River lowlands, which are within the License Area, are especially vulnerable to flooding from Berg Lake, which is impounded by the Steller lobe of the Bering Glacier and has a history of flooding (Combellick 1993). Beach ridges are visible several hundred feet above the current lake level and peak flow from another flood could exceed 1 million cubic feet per second (Post and Mayo 1971). Between 1993 and 1995, three outburst floods released pressurized water from subglacial conduits beneath the Bering Glacier during the glacier's surge (Fleisher et al. 2010). Other streams vulnerable to outburst flooding are Campbell and Seal rivers (Combellick 1993).

## 5. Mitigation Measures

Several natural hazards exist in the License Area that could pose potential risks to oil and gas installations.

Detailed site-specific studies may be necessary to identify specific earthquake hazards for any specific site within the area. The risks from earthquake damage can be mitigated by siting facilities away from potentially active faults and unstable areas, and by designing them to meet or exceed national standards and International Building Code seismic specifications for Alaska. Additionally, mitigation measures requiring the siting of facilities away from waterbodies and fish bearing rivers are included in this license to reduce the potential for flood damage to facilities and the resulting effects on the environment.

Although natural hazards could damage oil and gas infrastructure, measures in this best interest finding, regulations, in addition to design and construction standards, are expected to mitigate those hazards. Mitigation measures in this finding address siting of facilities and design and construction of pipelines. A complete listing of mitigation measures is found in Chapter Nine.

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# Chapter Four: Habitats, Fish, and Wildlife

## Contents

	<b>Page</b>
A. Habitats of the Area .....	4-1
1. Marine and Coastal Habitats .....	4-2
a. Intertidal Mudflats .....	4-2
b. Estuaries .....	4-3
c. Barrier Islands .....	4-3
2. Freshwater Habitats .....	4-3
3. Wetlands .....	4-4
B. Fish and Wildlife Populations .....	4-4
1. Fish .....	4-5
a. Salmon .....	4-5
i. Chinook (King) Salmon .....	4-5
ii. Sockeye (Red) Salmon .....	4-6
iii. Chum (Dog) Salmon .....	4-6
iv. Coho (Silver) Salmon .....	4-7
v. Pink Salmon .....	4-7
b. Other Anadromous and Freshwater Fish .....	4-8
i. Dolly Varden .....	4-8
ii. Rainbow Trout/Steelhead .....	4-8
iii. Cutthroat Trout .....	4-9
iv. Eulachon .....	4-9
c. Marine Fish .....	4-10
i. Pacific Halibut .....	4-10
ii. Rockfish .....	4-10
iii. Pacific Herring .....	4-11
iv. Capelin .....	4-11
v. Pacific Sand Lance .....	4-11
vi. Flathead Sole .....	4-12
d. Marine Invertebrates .....	4-12
i. Clams .....	4-12
ii. Scallops .....	4-12
iii. Dungeness Crab .....	4-13
iv. Tanner Crab .....	4-13
v. Shrimp .....	4-14
2. Birds .....	4-15
a. Waterfowl .....	4-15
i. Dusky Canada Goose .....	4-15
ii. Trumpeter Swan .....	4-15
iii. Tule White-Fronted Goose .....	4-16
b. Seabirds .....	4-16
i. Aleutian Tern .....	4-17
ii. Murrelets .....	4-17
iii. Pigeon Guillemot .....	4-18
iv. Red-Faced Cormorant .....	4-18
v. Short-Tailed Albatross .....	4-19
c. Shorebirds .....	4-19



i. Dunlin .....	4-19
ii. Marbled Godwit.....	4-20
iii. Red Knot.....	4-20
iv. Western Sandpipers .....	4-21
d. Raptors and Landbirds .....	4-21
i. Bald Eagles .....	4-21
ii. Landbirds .....	4-22
3. Terrestrial Mammals .....	4-23
a. Bears .....	4-23
i. Black Bears .....	4-23
ii. Brown Bears .....	4-23
b. Moose.....	4-24
c. Mountain Goats.....	4-24
d. Furbearers .....	4-25
i. Beavers .....	4-25
ii. Marten.....	4-25
iii. River Otters.....	4-25
iv. Wolves .....	4-26
4. Marine Mammals .....	4-26
a. Northern Sea Otters.....	4-28
b. Pinnipeds: Sea Lions and Seals.....	4-28
i. Steller Sea Lions .....	4-28
ii. Harbor Seals.....	4-29
c. Baleen Whales .....	4-30
i. Fin Whales .....	4-30
ii. Gray Whales .....	4-30
iii. Humpback Whales.....	4-31
iv. North Pacific Right Whales .....	4-32
d. Toothed Whales .....	4-32
i. Killer whales.....	4-32
ii. Sperm Whales .....	4-33
iii. Dall's Porpoises .....	4-33
iv. Harbor Porpoises .....	4-34
C. References .....	4-35

## Chapter Four: Habitats, Fish, and Wildlife

This chapter considers and discusses the Gulf of Alaska exploration license area's (License Area) habitats and fish and wildlife populations, as required by AS 38.05.035(g)(iii). This chapter is not intended to be an exhaustive examination of all habitats and fish and wildlife of the area, but rather the director limited the scope of the administrative review and finding to consider and discuss those habitats and fish and wildlife that have subsistence, recreational, or commercial value and that are material to the finding of whether the exploration license will best serve the interests of the state (AS 38.05.035(e)(1)(B)).

### A. Habitats of the Area

The landforms, vegetation types, waterbodies, wetlands, and coastal waters of the License Area provide habitat for fish and wildlife. Some fish and wildlife of particular importance include salmon (*Oncorhynchus* spp.), black (*Ursus americanus*) and brown bears (*Ursus arctos*), furbearers, waterfowl, shorebirds, and the marine mammals that are present in the nearshore and offshore environments. The habitats in and near the License Area are important for many migratory birds.

The License Area lies within the Gulf of Alaska Coast ecoregion. The ecoregions were described cooperatively by the United States Forest Service (USFS), United States Geological Survey (USGS), National Park Service, and private organizations. An ecoregion is a major ecosystem defined by distinctive geography and that has characteristic flora and fauna and distinct amounts of moisture and solar radiation. The ecoregion that the License Area is located in is described as a temperate rain forest that includes open wetlands and hemlock (*Tsuga* spp.) and spruce (*Picea* spp.) forests with persistent snow at sea level that remains present for long periods of time (Nowacki et al. 2001). Additionally, the Environmental Protection Agency (EPA) defines the various ecological regions, and the License Area is located in the Coastal Western Hemlock(*Tsuga heterophylla*)-Sitka Spruce (*Picea stichensis*) Forests region (EPA 2006). The forests of this ecoregion are dominated by hemlock and spruce with open wetlands that are present along the coast (Gallant et al. 1995). In this region, a coastal foreland and associated shoreline features extend southeast from the Copper River delta to Icy Point (Nowacki et al. 2001).

Most of the acreage of the License Area is offshore in the marine environment within Controller Bay in the Gulf of Alaska. Freshwater habitats in the License Area include the outlets of several streams and rivers originating in the Ragged Mountains and Don Miller Hills; and ice fields including the Bering, Steller, and Martin River Glaciers. The rivers and streams in or directly discharging to the License Area include Kahuntla Creek, Clear Creek, Katalla River, Arvesta Creek, Redwood Creek, Mary's Creek, Puffy Creek, Barrett Creek, Burls Creek, Chilkat Creek, Bering River, Nichawak River, Campbell River, Okalee River, Kwinlatah Slough, and Edwardes River (Johnson, J. and Blossom 2018).

## **1. Marine and Coastal Habitats**

The Gulf of Alaska coastline encompasses a range of habitats that include rocky shorelines, sandy beaches, mud flats, and coastal mountains. The entire coastline is backed by the Chugach and Robinson mountain ranges. Weather patterns and water circulation in the North Pacific influence the region's habitat diversity. From the east, coastal ocean currents flow into Prince William Sound, an estuarine embayment of the Gulf of Alaska, and flow out through the west, resulting in a monthly water exchange. Circulation varies seasonally, and researchers estimate that as much as 40 percent of the volume of Prince William Sound to a depth of 100 meters is exchanged in the summer, and 200 percent is exchanged in winter (Schoch and McCammon 2012).

The Gulf of Alaska coast is about 152 miles long, from Gravel Point south of Cordova to Ocean Point on the Phipps Peninsula northwest of Yakutat. Along the Gulf of Alaska to the northeast, are the Yakataga, Malaspina, and Yakutat forelands. Currents circulating through and around the Gulf of Alaska contribute to the rich Gulf of Alaska ecosystem and variations in these nearshore flows and eddies affect much of the coast's biological variability. The Alaska gyre, an eastward flowing, subarctic current system at 50° north latitude, and the Alaska Coastal Current, flow counterclockwise along the northern Gulf of Alaska (Ladd et al. 2005). The Alaska Coastal Current, further offshore at the boundary of the continental shelf and deeper water, runs northwest, and the Alaska Stream runs southwestward along the western edge of the boundary. Among them, they support open ocean circulation on a regional scale (Miller et al. 2005).

One theory that may explain why the Gulf of Alaska supports such a rich ecosystem is cross-shelf exchange. Researchers found that streams emptying from shore and into the Gulf of Alaska are low in nitrates and that the Gulf of Alaska basin is rich in nitrates (Miller et al. 2005). The large gyre in the deep waters to the west of Controller Bay attract large schools of Pacific herring (*Clupea pallasii*) and capelin (*Mallotus villosus*) which provide food for larger predators (Cline 2005). The exchange mechanism for the different nitrate levels could be an exchange across the shelf, or an exchange at the basin and shelf, that involves periodic upwelling eddies, tidal mixing, and changes in direction caused by varying depths in the Gulf of Alaska. Eddies form during the winter near Yakutat, propagate along the shelf break, and migrate west to an area east of Kodiak Island (Ladd et al. 2005).

### **a. Intertidal Mudflats**

Intertidal mudflats are coastal wetlands that provide sources of energy in coastal food webs as migrating birds, demersal fish, and crustaceans forage on them for macroinvertebrates. Additionally, harbor seals (*Phoca vitulina*) haulout on mudflats and protected beaches, which are also nursery and spawning habitat for herring and crabs (ADF&G 2006).

Four benthic organisms in the substrates of the Copper River delta account for the majority of animals with over 95 percent of the biomass: the bivalves *Macoma balthica* and *Mya arenaria*, the amphipod *Corophium salmonis*, and the polychaete *Eteone*. These invertebrates are important prey for shorebirds, ducks, crabs, and fish. The Copper River delta mudflats are a vital stopover habitat for migrating birds. The Baltic macoma (*Macoma balthica*), a small clam, can provide up to 30 percent of a migrating shorebird's diet. Waterfowl also take advantage of the clam's abundance and feed on these mudflats throughout the winter. Out-migrating salmon smolt likely feed on the

Copper River delta's copepods and amphipods, which are a significant portion of a smolt's diet (ADF&G 2006; Powers et al. 2006).

### **b. Estuaries**

An estuary is a coastal body of brackish water that is partially enclosed where rivers and streams flow in and ocean water can flow in and out. Estuaries are some of the world's most productive ecosystems and are typically located where rivers flow into the ocean. They are home to unique communities of plants and animals that are specially adapted to the mix of saltwater and freshwater. They serve as natural nurseries for many species of birds and fish. Eelgrass (*Zostera marina*) beds exist in the Gulf of Alaska in shallow water and near shore. Juvenile salmon use them as nurseries, and herring for spawning, where they lay as many as three million eggs per eelgrass blade in the spring. The eggs attract seabirds and fish; some ducks and geese feed on the plant directly (ADF&G 2006). Between 1999 and 2010, researchers collected 54 species of fish in Prince William Sound. The number of species and catch per unit effort varied with the 21 species in sandy bottom habitats and 41 species in eelgrass habitats typical of most estuaries. Pacific herring (*Clupea pallasii*), saffron cod (*Eleginus gracilis*), pink salmon (*Oncorhynchus gorbuscha*), and capelin (*Mallotus villosus*) accounted for 90 percent of the catch (Johnson, S. W. et al. 2012).

### **c. Barrier Islands**

Barrier islands are dune-dominated ecosystems created by wind, wave, and transport of sand and silt along the shore. These are highly dynamic, unstable, sandy, elongate islands separated from the mainland by an estuary or bay. Barrier islands and spits form a discontinuous line across the width of the Copper River delta. Barrier islands within or adjacent to the License Area include Kanak Island and Okalee Spit. Barrier islands can be up to one-mile wide and eight miles long and are typically less than 30 feet in elevation (Boggs 2000). Okalee Spit supports nesting colonies of Arctic terns (*Sterna paradisaea*) and glaucous-winged gulls (*Larus glaucescens*) (Cline 2005). Harbor seals use the barrier islands to haulout and raise their pups and resting during the molt. In the spring, millions of shorebirds gather on the barrier islands along the Copper River delta as a stopover on their way to nesting grounds further north (ADF&G 2020b). In contrast, Wingham and Kayak islands are characterized by steep terrain dominated by coniferous forest, high gradient streams and rocky beaches. These islands support nesting colonies of black-legged kittiwakes (*Rissa tridactyla*) and common murrelets (*Uria aalge*), with Pinnacle Rock, off the tip of Cape Saint Elias, supporting nesting colonies of tufted puffins (*Fratercula cirrhata*), common murrelets, cormorants (*Phalacrocorax* spp.) and glaucous-winged gulls and a Steller sea lion (*Eumetopias jubatus*) haulout (Cline 2005).

## **2. Freshwater Habitats**

The License Area's waterways, riparian zones, and ponds sustain fish and wildlife populations. Water provides migratory routes, spawning and rearing habitats, and overwintering habitats for aquatic species. Terrestrial wildlife use the water and areas surrounding them for nesting and breeding areas and for seasonal or transportation corridors. Waterbirds that overwinter elsewhere in the country, or in other habitats within Alaska, spend their summers in ponds and lakes for the summer mating, nesting, and rearing season (ADF&G 2006).

Riparian zones are the interface between terrestrial and aquatic habitats. Among their several functions is to provide leaf litter, filter sediments and pollution, reduce wind, and regulate water temperature through shading and heat retention. Their root systems provide stream bank and floodplain integrity and stability (ADF&G 2006).

### **3. Wetlands**

Wetlands are characterized by poor soil drainage and represent a transitional zone between aquatic and terrestrial habitats. They are inundated or saturated by surface water or groundwater at a frequency or duration sufficient to support a prevalence of vegetation that is adapted for life in saturated soil. Wetlands are present in the License Area. Bogs, salt marshes, freshwater grass, and freshwater sedge are all types of wetlands, and wetland habitats are heavily used as summer staging and breeding grounds for large numbers of migratory birds (ADF&G 2006).

Grass wetlands are composed of 50 percent or more water-tolerant grass species such as Pacific reed grass, red fescue, and blue-joint small bedstraw. They may occur in clumps or tussocks and may be intermixed with pure stands of sedges. In addition to providing wildlife habitat, grass wetlands are groundwater recharge areas that store storm and floodwaters and maintain minimum base flows for downstream aquatic resources (ADF&G 2006).

Salt marshes are intertidal wetlands vegetated with sedges, goose tongue (*Plantago maritima*), and other salt-tolerant plants. They are typically at the mouths of rivers, behind barrier islands, coves, spits, and on tide flats with low-energy wave action and elevated land. Zooplankton, copepods, amphipods, and other organisms low on the food chain but important to the food web for larger animals, are found here. Salt marshes also provide spawning and nursery habitat for marine invertebrates and forage fishes (ADF&G 2006).

Most of the wetlands in the Gulf of Alaska are in the Copper River delta. The delta is a discontinuous series of coastal wetlands that parallel the Gulf of Alaska coastline for 75 miles and have a maximum width of 37 miles. The sediment load deposited by the Copper River is estimated to be 97 million metric tons annually. The delta forms where the river meets the ocean, the current slows, and the sediments precipitate out. Wetland ecosystems dominate the delta and are of primary importance for fish, waterfowl, and moose (*Alces americanus*) (ADF&G 2020b).

The predominant types of wetland in the eastern Copper River delta are both tidal and non-tidal wetlands. These are dominated by trees and shrubs in a complex that includes uplifted marshes, wet meadows, fens, and small, shallow ponds. About 5,000 acres of marine wetlands exist along the coastlines of Okalee Spit, Kanak Island, within the License Area, and Softuk Bar, which is just west of the License Area boundary (Kesti et al. 2004).

## **B. Fish and Wildlife Populations**

The diversity of the landforms and vegetation types, abundance of streams and wetlands, and productive estuarine and coastal habitats in the License Area provide habitat for a wide variety of Alaska's fish and wildlife. The scope of review for the fish and wildlife populations includes animals that are important to subsistence, sport, commercial, or other fishing; hunting or trapping;

wildlife viewing; and species of conservation concern. Of the 121 species in the Gulf of Alaska bioregion, and the 170 species in the Southcentral Alaska bioregion identified as conservation concerns in the Alaska Wildlife Action Plan (ADF&G 2015a, Appendix B), those species of greatest concern or with notable concentrations within or near the License Area are described in the following sections.

## **1. Fish**

Rivers and streams within the License Area are important spawning areas for anadromous fish, including Chinook (king) *Oncorhynchus tshawytscha*, sockeye (red) *O. nerka*, chum (dog) *O. keta*, pink (humpback) *O. gorbuscha*, and coho (silver) *O. kisutch* salmon. Steelhead trout (*O. mykiss*), cutthroat trout (*O. clarkii*), Dolly Varden (*Salvelinus malma*), and eulachon (*Thaleichthys pacificus*) are also present in the License Area's rivers and streams. Water bodies that provide habitat for anadromous fish in the License Area include Kahuntla Creek, Clear Creek, Katalla River, Arvesta Creek, Redwood Creek, Mary's Creek, Puffy Creek, Barrett Creek, Burls Creek, Chilkat Creek, Bering River, Nichawak River, Campbell River, and the Edwardes River. The Okalee River and Kwinlatah Slough at the head of Controller Bay are within ¼ mile of the License Area and also provide habitat for anadromous fish. These water bodies provide spawning, rearing, and overwintering sites for both anadromous and resident fish (Johnson, J. and Blossom 2018).

### **a. Salmon**

The region's Chinook and sockeye salmon, specifically in the Copper River and its tributaries, are some of the earliest runs of these species in Alaska. They are considered to be high quality, and thus valuable for fish markets throughout the United States and the world (ADF&G 2016a). The License Area overlaps essential fish habitat for all five species of Pacific Salmon. However, there are no habitat areas of particular concern in the License Area, and none of the essential fish habitat areas for salmon restrict fishing (NOAA Fisheries 2018a).

#### **i. Chinook (King) Salmon**

Spawning populations of Chinook salmon are found in streams and rivers within the License Area. Chinook salmon are the largest of the Pacific salmon species at maturity and can exceed 30 pounds. Adult Chinook salmon have irregular black spotting on the back and dorsal fins and on both lobes of the tail fin. Chinook salmon hatch in fresh water and rear in rivers for one year, feeding on plankton and insects. The following spring the smolt migrate to an estuary before migrating to the open ocean, where they spend from 1 to 5 years feeding on herring, Pacific sardine (*Sardinops sagax*), Pacific sand lance (*Ammodytes hexapterus*), squid, and crustaceans. They return to their natal streams to spawn in fresh water between May and July, and they do not feed once they enter the freshwater for spawning. The females lay between 3,000 and 14,000 eggs in gravel nests (ADF&G 2008b).

There is some cause for long-term concern because of recent population declines (ADF&G 2008b). Chinook salmon are stocked in some areas of Prince William Sound by ADF&G and the Prince William Sound Aquaculture Corporation, but there is a large geographic separation between the release sites and the License Area. ADF&G has released between 43,000 and 150,000 Chinook smolt annually since 1999 in Cordova, Valdez, and Whittier with the objective to create additional

angler opportunities in the region (ADF&G 2018i). In the License Area, Chinook salmon are present in the Bering River (Johnson, J. and Blossom 2018).

### ***ii. Sockeye (Red) Salmon***

Spawning populations of sockeye salmon are found in streams and rivers within the License Area. Sockeye salmon are one of the smaller species of Pacific salmon; adult sockeye salmon measure 18 to 31 inches long and weigh 4 to 15 pounds. They have distinct silver sides, a white belly, and metallic green-blue back. They spend one to three years in the ocean before returning to their natal streams to spawn. They typically return to spawn in June and July in rivers and streams with lakes as their headwaters. The females lay between 2,000-5,000 eggs in redds on the shores of the rivers, or lakes where they return. Eggs hatch during the winter and the alevins remain in the gravel until spring, when they emerge as fry and move to rearing areas. Juveniles spend one to three years in fresh water and feed on zooplankton and small crustaceans before migrating to sea. While at sea, sockeye feed on zooplankton, larval and small adult fishes, and squid (ADF&G 2008b).

There is one hatchery permitted to produce sockeye salmon eggs in the Copper River watershed. In the upper Copper River drainage, the Gulkana Hatchery take up to 36.75 million eggs annually. It was established in 1973 and releases sockeye salmon fry into the Gulkana River drainage (PWSAC 2018). Martin, Little Martin, Bering, Kushatka, and Tokun lakes are particularly important sockeye rearing habitats found between the Copper River delta and Bering Glacier (Kesti et al. 2004). In the License Area, sockeye salmon are present in the Edwardes, Campbell, and Bering rivers (Johnson, J. and Blossom 2018).

### ***iii. Chum (Dog) Salmon***

Chum salmon are found in the License Area along the Gulf of Alaska coast east of the Copper River, in the east Copper River delta, and in the Bering and Controller Bay watersheds. They appear in lesser numbers in the Katalla, Martin, and North river watersheds (Kesti et al. 2004). Adult chum salmon average 24 to 28 inches long and weigh 10 to 13 pounds. They are the most widely distributed of all Pacific salmon and have metallic bluish green on their back with many tiny speckles often present. Their tail is highly forked and has silver streaks along their fin rays (ADF&G 2018e).

Chum salmon spawn from June through August in the Prince William Sound area. They prefer to spawn in small to medium, slow-flowing side channels, though they also will spawn in large, muddy rivers, in cold and clear headwaters, and in the mouths of rivers below the high tide line. Eggs hatch after three to four months and the alevin remain in the gravel for an additional 60 to 90 days, after which they begin their migration to the sea within days or weeks. While migrating within rivers, they feed on insect larvae. When they reach the sea, they stay in the estuary and feed on crustaceans, insects, and young herring before forming schools and moving to saltwater, when they feed on zooplankton. In and around the Gulf of Alaska, wild chum salmon stocks have increased in size with the onset of the hatchery program (ADF&G 2018e).

The East River which is near Yakutat and to the east of the License Area, produces the most chum salmon in the area, although the run has declined over the past decade (Woods and Zeiser 2013). In the License Area, chum salmon are present in the Katalla and Bering rivers (Johnson, J. and Blossom 2018).

***iv. Coho (Silver) Salmon***

Coho salmon are present in the License Area and are the most widely distributed of the Pacific salmon species in the eastern Copper River delta. The eastern Copper River delta, Bering and Controller Bay watersheds produce the most coho salmon along the coast between Copper River and Kayak Island (Kesti et al. 2004).

Adult coho salmon typically weigh 8 to 12 pounds and are 24 to 30 inches long. They are bright silver with small black spots on their back and on the upper lobe of their tail fin. Spawning adults of both sexes have dark heads and backs and their sides turn maroon to red in color. Coho salmon spawn from July to November. The eggs develop over the winter and hatch in early spring. The alevins stay in the gravel until they emerge in May or June. In the autumn, juveniles move out of the main channel to pass the winter, which protects them from the effects of flooding. Some coho salmon leave fresh water in the spring to rear in brackish, estuarine ponds, and return to fresh water in the autumn. They spend one to three winters in streams and may spend up to five winters in lakes before migrating to sea. Most coho salmon stay at sea 18 months, feeding on small fishes, before returning to fresh water to spawn. Coho salmon populations in Alaska are healthy and expected to remain strong (ADF&G 2008b).

Several rivers along the gulf coast, east of Copper River, support strong coho salmon runs. The Tsiu River coho salmon run lasts for six to eight weeks from August to early October (Woods and Zeiser 2013). All of the listed anadromous streams in the License Area support coho salmon spawning and rearing (Johnson, J. and Blossom 2018).

***v. Pink Salmon***

Pink salmon are found throughout the License Area and generally spawn in small rivers near the coast and in estuaries at the mouths of rivers. Adult pink salmon weigh between 3 and 5 pounds and average 20 to 25 inches long. They are bright greenish-blue on their backs and their sides are silver in color with large dark spots on their backs and tail. Pink salmon spawn between late June and mid-September. When they reach their spawning streams, the males turn brown to black on their backs and the females turn olive green. Once they have entered the freshwater, the males develop a large hump on their back and hooked shaped jaws (ADF&G 2008b).

Pink salmon mature and complete their life cycle in two years. As soon as they emerge from their gravel spawning grounds, they migrate to the ocean, where they begin to feed on plankton, larval fishes, and aquatic insects. Pink salmon populations in Alaska are stable and well managed (ADF&G 2008b).

The Gulf of Alaska has hundreds of streams with pink salmon spawning habitat; in Prince William Sound alone, there are more than 200 pink salmon spawning streams. On the eastern side of the Copper River delta Pink Salmon are present in Copper River tributary streams and are also associated with major clear streams along the coast (Kesti et al. 2004). In the License Area they are present in Kahuntla and Arvesta creeks, and the Katalla, Bering rivers (Johnson, J. and Blossom 2018).



## **b. Other Anadromous and Freshwater Fish**

Other fish supporting subsistence and sport fisheries in the License Area include: Dolly Varden, rainbow, steelhead, and cutthroat trout, and eulachon.

### ***i. Dolly Varden***

Only the southern form of Dolly Varden are present in the License Area. They are closely related to Arctic char and distinguishing between the two requires close examination. Generally, Dolly Varden have more numerous spots that are smaller in size, whereas Arctic char have a more deeply forked tail, and a narrower caudal peduncle (the area before the tail fin) than Dolly Varden. Freshwater and sea-run Dolly Varden occur in the License Area. Freshwater Dolly Varden tend to be a much smaller fish, measuring 3 to 6 inches, and are found in small headwater streams, or in land-locked lakes and ponds (ADF&G 2019a). Along the Gulf of Alaska, the southern form of Dolly Varden inhabits the east Copper River delta, Controller Bay, and Bering River regions of the coast (Kesti et al. 2004). In the License Area, Dolly Varden are present in the Bering, Campbell, and Edwardes rivers (Johnson, J. and Blossom 2018).

The sea-run Dolly Varden reaches sexual maturity in five to six years, grows to a length of 12 to 16 inches, and lives less than eight years (ADF&G 2008b). Sea-run fish return to spawn annually in late August to November and will spawn more than once in their lives, but rarely more than three times (ADF&G 2019a). Alevins remain in the gravel, absorbing their yolk sacs, for 60 to 70 days before emerging in April and May. The young fish feed on insects and, later, annelids, fish eggs, and other small fish. After two to four years in freshwater, the fish begin to migrate to saltwater in May or June, where they will spend the summer feeding before returning to freshwater to spawn and spend the winter (ADF&G 2008b). In general, Dolly Varden are abundant and populations are stable in Alaska (ADF&G 2019a).

### ***ii. Rainbow Trout/Steelhead***

Rainbow trout (*Oncorhynchus mykiss*) are present in the License Area. Rainbow trout are freshwater residents, while steelhead are anadromous migrating to the ocean to feed and grow and returning to freshwater streams to spawn. Rainbow trout have a streamlined salmonid form but can range from slender to thick. They seek shallow gravel riffles in clear-water streams to spawn in late winter or early spring. Spawning begins in late March and lasts through early July. Eggs hatch a few weeks to four months after spawning, depending on water temperature. By mid-summer, fry emerge from the gravel to feed on crustaceans, plant material, and aquatic insects and their larvae. Resident rainbow trout move into lakes and streams after two or three years and eat fish, salmon carcasses, eggs, and small mammals. Rainbow trout mature in two or three years. Wild populations of rainbow trout are considered healthy in Alaska (ADF&G 2019b).

Steelhead are found in streams along the Gulf of Alaska coast, making them the northernmost wild stock in North America. Similar to other stocks at the edge of their distribution, they are relatively sparse and unproductive (Savereide 2008). Steelhead migrate through the upper Copper River from mid-August to mid-October (ADF&G 2019b). The Situk River, east of Yakutat and southeast of the License Area, is the largest known steelhead producer in Southeast Alaska (Harding and Coyle 2011).

Juvenile steelhead are indistinguishable from juvenile rainbow trout, but once they reach adulthood, they have small spots scattered on their backs and on top of their head. They will spend two to five years rearing in freshwater before going to the ocean, where they will feed on crustaceans, squid, small fish, and large zooplankton. They return to spawn in spring, summer, and fall and seek shallow gravel riffles in clear-water streams. The spring run returns between March and early June and summer-run fish are rare. Little information is available for steelhead stock status in Southcentral Alaska, but wild populations are considered to be stable (ADF&G 2008b, 2019b).

### ***iii. Cutthroat Trout***

Cutthroat trout are either sea-run or freshwater-resident in streams and lakes along the Gulf of Alaska coast to Prince William Sound. Cutthroat trout are present in numerous streams and lakes throughout Prince William Sound, though the extent of their distribution and abundance is unknown (Blain-Roth et al. 2017). The Clear Martin, Glacial Martin, and Green rivers of the eastern Copper River delta host sea-run cutthroat trout populations (Marston et al. 2011). The Kushtaka and Bering rivers host a sea run of cutthroat trout, which drain in to Katalla and Controllor bays respectively in the License Area (Kesti et al. 2004; Johnson, J. and Blossom 2018). Prince William Sound is the northernmost range of cutthroat trout distribution (Marston et al. 2011).

Freshwater resident cutthroat trout live in headwater tributaries, bog ponds, large lakes, and rivers. Sea-run cutthroat trout prefer river or stream systems with accessible lakes (ADF&G 2008b). Adult coloration varies with habitat as freshwater resident fish are larger than the sea-run relatives and have a golden yellow coloring and red markings under their jaw. Sea-run cutthroat trout generally do not exceed 18 inches long and have bluish silver coloring and less spotting on their backs. Their life history traits vary within drainages and among populations; resident and anadromous forms can exist within populations, and individuals may have both traits (Marston et al. 2011).

Cutthroat trout spawn from April to early June in gravel beds in small isolated headwater streams. Their eggs remain in the gravel for six to seven weeks before hatching. Newly hatched fish remain in the gravel an additional one to two weeks before emerging as juveniles. Juveniles disperse to the rearing habitat of ponds, lakes, and backwaters where they feed on insects and small fish (ADF&G 2018f).

Sea-run cutthroat trout will stay in fresh water three to four years before their first migration to sea in April. They may stay for a few days to as many as 100 days at sea. Their return to freshwater begins as early as mid-summer and peaks from September to October. Once in their home stream, they feed on young salmon and amphipods (ADF&G 2008b). Population trends are difficult to determine because of the lack of long-term information, but for sea-run populations, where long-term trend information exists, their numbers are declining (ADF&G 2018f).

### ***iv. Eulachon***

Eulachon are a small fish that grows up to 10 inches in length and are blue-silver colored in saltwater and turn gray-brown and green when they move into freshwater to spawn. They are seasonally abundant in the Copper River delta of the Gulf of Alaska area near the License Area. Eulachon are anadromous fish that spawn and hatch in freshwater streams. Female eulachon can produce up to 30,000 eggs and they normally die after spawning. Eggs hatch in 21 to 40 days and

the young are carried by the river to saltwater. There, they feed on copepod larvae and other plankton. After three to six years they return to spawn. Little information is available on the population status of eulachon in Alaska and the strength of their returns is variable (ADF&G 2008b, 2018g).

### **c. Marine Fish**

#### **i. Pacific Halibut**

Pacific halibut (*Hippoglossus stenolepis*) are found throughout the Gulf of Alaska in and around the License Area. They are the largest flatfish in the family Pleuronectidae. The upper side is normally gray or brown with spots so that they blend with the sandy ocean floor. Both eyes are located on the upper side of the body. Their bottom side is white. Most male halibut mature sexually by age eight and females by age 12 or older, and they can live for 55 years. They spawn in offshore waters between November and March at depths of 300 to 1,500 feet. Halibut generally migrate eastward and southward against the Gulf of Alaska coastal current moving opposite of the westward drifting eggs and larvae (ADF&G 2018j).

Female halibut release a few thousand to several million eggs, which are fertilized externally. About 15 days later, eggs hatch and the larvae drift on deep currents. As they mature, they move higher in the water column and ride surface currents to shallower and more nutrient-rich coastal waters. Halibut feed on plankton their first year, then on euphysiids and small fish between ages one and three, and feed mostly on fish as they grow larger. Adult halibut eat herring, sand lance, capelin, smelt, walleye pollock (*Gadus chalcogrammus*), sablefish (*Anoplopoma fimbria*), cod, and rockfish. Their preferred habitat is in waters between 20 and 1,000 feet and water temperatures of 37 to 46 °F (ADF&G 2008b).

The International Halibut Commission assesses the status of halibut of the northeast Pacific Ocean, an area that extends from northern California to the Aleutian Islands and the Bering Sea. Their stock assessments are not specific to the License Area, but the 2018 assessment indicates the stock has been declining through the last decade and is projected to decrease gradually in the two years following the assessment. Decreased size of the fish at spawning age and declining recruitment trends are factors in the decline in recent stock numbers (Stewart and Hicks 2018).

#### **ii. Rockfish**

There are 25 species of rockfish in the Gulf of Alaska region near the License Area, and nearby deep waters accommodate range preferences among the many species. They prefer rocky habitats with high relief and strong currents (Kline 2007). Black (*Sebastes melanops*) and yelloweye rockfish (*S. ruberrimus*) support important commercial fisheries (ADF&G 2018h).

Yelloweye rockfish stay close to the bottom in rocky areas (ADF&G 2008b). They release live larval young between February and September. Their larvae feed on algae and other single-celled organisms and on small crustaceans. When they grow to adulthood, their prey shifts to other rockfish, sand lance (*Ammodytes* sp.), herring, flatfishes, and crustaceans. Yelloweye rockfish occupy steep rocky areas with lots of shelter and they typically live between 300 and 600 feet below the surface (ADF&G 2018h).

Black rockfish congregate in large schools throughout the water column, above or around rocky pinnacles (ADF&G 2008b). Adults weigh up to 11 pounds and reach 27 inches in length. Males reach sexual maturity around age 18 and females around 22. Black rockfish release larvae from January to May. They feed on zooplankton, Dungeness crab (*Metacarcinus magister*) larvae, herring, and sand lance. Black rockfish occupy the continental shelf at the surface to depths of 1,200 feet but usually are found in about 500 feet of water. The ADF&G Rockfish Initiative is an interdivisional group formed in 2017, with the first phase of its work focusing on black and yelloweye rockfish. There are no stock assessments for these two species, but research is currently being conducted and methods to assess rockfish are underway. In the meantime, one of the goals of the Rockfish Initiative is to maintain current stocks of black and yelloweye rockfish and not increase their harvest levels (Howard et al. 2019).

### **iii. Pacific Herring**

Pacific herring (*Clupea pallasii*) are the most abundant forage fish present in and around the License Area; providing high quality prey for birds, marine mammals, and other fish. Herring become sexually mature at three to four years and spawn annually after that. They spawn in spring in shallow, vegetated areas in intertidal and sub tidal zones. Near the License Area herring spawn on eelgrass beds around the north half of Kayak Island and around Wingham Island (Haught and Moffitt 2020). Eggs hatch about two weeks after being fertilized and the larvae drift in the current. After reaching the juvenile stage they rear in sheltered bays and inlets. Schools of juveniles move offshore in the autumn, where they spend the next two to three years feeding on crustaceans, decapods, and mollusk larvae; adults eat mostly large crustaceans and small fish. Population trends for Pacific herring are dynamic and subject to environmental changes (ADF&G 2018h).

### **iv. Capelin**

Capelin (*Mallotus villosus*) is an important forage fish found in the Gulf of Alaska in and around the License Area. They play a key role in the marine food web as high energy food sources for fish, whales, and sea birds. Capelin are historically abundant in Alaska, and the Gulf of Alaska stocks peaked in 1980, but by the mid-1990s had disappeared from survey catches. More recent biomass estimates indicate a return to stable populations numbers with large spawning numbers (ADF&G 2018h).

Capelin spend most of their lives offshore. They reach sexual maturity at ages two and three and spawn during mid-May to late July on coarse sand or gravel beaches. They come close to the shore only to spawn. They feed on planktonic crustaceans, copepods, euphausiids, amphipods, marine worms, and small fishes. Capelin stocks appear to be rebounding in Prince William Sound and the Gulf of Alaska. They are protected from targeted fisheries and cannot comprise more than 2 percent of commercial bycatch (ADF&G 2018h).

### **v. Pacific Sand Lance**

The Pacific sand lance (*Ammodytes hexapterus*) is a key forage fish for seabirds, fish, and marine mammals in and around the License Area. Sand lance prefer nearshore and intertidal environments. They burrow in fine sand and gravel free of mud where there is a strong bottom current. They are most common at depths less than 165 feet (ADF&G 2018h).

Sand lance do not migrate for spawning but rather move from their offshore habitat to the intertidal zone and spawn once a year from late August through October. Eggs develop in up to 67 days. Larvae feed on phytoplankton and early zooplankton stages. Adults feed in schools and eat mostly copepods. In autumn and winter, sand lance incorporate invertebrates, herring larvae, and eggs into their diet. Sand lance are considered common to abundant with large population fluctuations observed every few years (ADF&G 2018h).

#### **vi. Flathead Sole**

Flathead sole (*Hippoglossoides elassodon*) are a flatfish with both eyes on the right side of their heads; and they are white on the bottom with brown blotchy coloring on the top. They can live up to 34 years and grow up to 1.8 feet long. They can breed at 6 years old in the colder waters of the License Area and the females can lay up to 600,000 eggs. They feed on benthic invertebrates, some smaller fish and squid (NOAA Fisheries 2018b). Flathead sole are abundant in Alaska and the population is above the target levels for sustaining the stock. They are not overfished or subject to overfishing (Turnock et al. 2017).

### **d. Marine Invertebrates**

#### **i. Clams**

Littleneck (*Leukoma staminea*) and razor (*Siliqua patula*) clams are found in and around the License Area. Spawn timing depends on water temperature. Littleneck clams are believed to begin spawning in May for one four-month period. After fertilization, eggs grow rapidly and within 12 hours become larvae. Larvae drift before they metamorphose and begin eating phytoplankton. Littlenecks mature at age three or four and are roughly 1 to 2 inches long. They can live 10 to 13 years along rocky shorelines or in small patches on large beaches, favoring coarse sand or fine gravel mixed with mud (ADF&G 2018k).

Razor clams reach sexual maturity as soon as the end of their third year and all are mature by the seventh year. They breed between May and September, stimulated by increasing water temperatures. They spawn hundreds of thousands of larvae, which are free swimming for five to 16 weeks, during which time the shells begin to grow. Young clams then alight on sand, where they remain, feeding on plankton. They are found from four feet above mean low water to depths of 180 feet (ADF&G 2018k). ADF&G does not assess razor clam abundance but reports from non-commercial diggers indicate that abundance is low in the eastern Copper River delta, Katalla, and Controller Bay areas compared to past surveys (Rumble et al. 2016).

#### **ii. Scallops**

Weathervane scallops (*Patinopecten caurinus*) are found in and around the License Area. Scallops usually mature around age three or four and reproduce by congregating and then releasing clouds of eggs and sperm, which are fertilized in the water column. Increasing water temperatures appear to be the trigger, and spawning occurs in May and June. Fertilized eggs settle to the bottom, where they develop into larvae. The larvae then feed in the water column for about three weeks and then settle to the bottom again to begin life as benthic filter feeders. They live to a maximum age of 28 years, prefer mud, clay, sand, or gravel substrate in depths of 120 to 390 feet, and amass in dense beds (ADF&G 2018k). Scallop biomass estimates from ADF&G fishery independent surveys

conducted since 1996 have fluctuated in the two beds adjacent to Kayak Island: East and West beds. Biomass estimates from the survey peaked between 2004 and 2006 and have remained at relatively low or declining levels since 2008. Abundance in the East Bed was at its lowest level in the history of the survey in 2018, and abundance in the West Bed declined significantly since the last survey in 2016. The commercial fishery in both beds are scheduled to be closed in the 2019/2020 season (NPFMC 2018)

### **iii. Dungeness Crab**

Dungeness crab inhabit bays, estuaries, and the nearshore coast of Alaska in the Copper River delta and Controller Bay areas in and around the License Area. They have a broad oval shaped body covered by a smooth hard shell with four pairs of short walking legs and a pair of small pinching claws. Dungeness crab mate from spring through fall but the female will store the sperm in internal pouches until her shell hardens. Fertilization then occurs about 1 month after mating. A large female can carry up to 2.5 million eggs; after hatching, the plankton-like larvae drift away. A crab has six successive larval stages before molting into its first juvenile stage. The larvae develop over 4 months and sometimes for up to a year. They reach sexual maturity at 3 years. Dungeness crabs are both scavenger and predator, and eat bivalves, worms, shrimp, fish, and small crab (ADF&G 2018k).

Dungeness once supported fisheries in and near Cordova, along the eastern portion of the Copper River delta, Controller Bay and in Yakutat. The Orca Inlet fishery closed in 1980, the Copper River fishery in 1992 and the Yakutat fishery in 2000. Abundance remains low despite long term fishery closures (ADF&G 2016b; Rumble et al. 2016). The Dungeness crab sport fishery in Yakutat closed in 2005. The stocks does not appear to be rebuilding potentially due to bycatch by the salmon gillnet fleet (ADF&G 2016b; Rumble et al. 2016).

### **iv. Tanner Crab**

Tanner crab (*Chionoecetes bairdi* and *C. opilio*) are present in and around the License Area. They have five pairs of legs with the first pair equipped with pincers. Males vary in weight from 1 to 2 pounds for opilio and 2 to 4 pounds for bairdi crabs. Tanner crab are typically marketed under the name “snow crab.” The body is composed mainly of a chitinous shell or carapace with a small abdominal flap. Migration patterns are not well understood; however, it is known that the sexes are separated during much of the year and move into the same areas during the reproductive season. Tanner crabs feed on a wide assortment of marine life including worms, clams, mussels, snails, crabs, other crustaceans, and fish parts (ADF&G 2020i). Large-mesh multi-species trawl surveys have been conducted in Prince William Sound from 1991 to the present. Data from these surveys have been used to estimate the relative abundance of Tanner crab within the Hinchinbrook district, Orca Bay and adjacent fjords, near Valdez and to track king crab density. A management plan has been developed for the Northern and Hinchinbrook portion of Prince William Sound with legal male Tanner crab thresholds that trigger a commercial fishery (Rumble et al. 2019).

Estimates of legal male Tanner crab abundance dropped precipitously between 1993 and 1999, from approximately 100,000 legal males to a little more than 3,500 legal males. Numbers of legal males increased steadily from 2001 through 2009 to almost 80,000 crab and then reaching a high estimate in 2011 and 2013 of about 185,000 crabs with lower estimates in following years. A

commissioner's permit Tanner crab fishery has been prosecuted in 2018 and 2019 in the southwestern portion and outside waters of Prince William Sound in the absence of an abundance survey for those areas; a pot survey was conducted in 2018 and is planned for 2019 to evaluate these new fishery areas (Rumble et al. 2019).

#### **v. *Shrimp***

Northern shrimp (*Pandalus eous*) and spot shrimp (*P. platyceros*) are present in and around the License Area. Northern shrimp are medium-sized shrimp with a slender body. They have a uniform pink color. Their larvae hatch in the spring and swim throughout the water column for most of the first summer. They molt as they grow, shedding their outgrown external skeletons and growing new, larger ones. By the end of the summer, the larvae settle to the bottom and begin the juvenile phase. During the second summer, they molt again and become sexually mature, typically as males. After breeding at least one or two times as a male, they gradually transform permanently into females (ADF&G 2020f).

Northern shrimp breed in the fall, after the females molt and become ready for breeding. When the embryos are ready to hatch the following spring, the female rests on the bottom and fans water under her abdomen to disperse the hatched larvae. Females typically hatch around 2,000 eggs (ADF&G 2020f).

Northern shrimp may live for a maximum of at least 5 or 6 years in the Gulf of Alaska. Northern shrimp migrate into the water column each night to feed on small crustaceans and other zooplankton. When targeting plankton, northern shrimp filter feed, capturing their prey by trapping it among their legs. During the day however, they typically forage in the bottom sediments on worms, small crustaceans, algae, and dead organic matter. The abundance of northern shrimp is correlated with the organic content of bottom sediments (ADF&G 2020f).

Spot shrimp are the largest of the shrimps in this region with large females exceeding 23 cm in length. Its body color is usually reddish brown or tan, with white horizontal bars on the carapace, and distinctive white spots on the first and fifth abdominal segments. The body is generally slender and there are five pairs of "swimmerets" located on the underside of the abdomen. Each individual spends the early mature part of life as a male and later transforms into a female for the balance of its lifetime (ADF&G 2020h).

Spot shrimp can reach sexual maturity by the third year. Some may mature sexually and spawn as a male, pass through a transitional phase and subsequently mature and spawn as a female. Some juveniles, however, never mature into males; instead, they develop directly into females. Prior to fertilization, the mature female molts into a shell specialized for carrying eggs. Eggs are found on females from October to March. Each spot shrimp spawns once as a male and one or more times as a female. Tagging studies in Prince William Sound, found that spot shrimp may live from seven to eleven years. Spot shrimp are opportunistic bottom feeders that tend to feed at night. They will eat a wide variety of items such as worms, diatoms, dead organic material, algae, small mollusks, sponges, and other shrimp (ADF&G 2020h).

## **2. Birds**

Waterfowl, seabirds, shorebirds, raptors, and passerines use the region surrounding the License Area for breeding, rearing, and feeding. The License Area encompasses a highly productive and diverse coastal ecosystem that hosts an abundance of birds, particularly during spring migration. In addition to the species described below, dozens of species of conservation concern use coastal and marine habitats in the License Area (ADF&G 2015a). The License Area is located within the National Audubon Society's Copper River Delta Important Bird Area (IBA), and a small portion of the License Area's northwest corner is located within the East Copper River Delta Colonies IBA. Both of these IBAs have been categorized as global priorities (Audubon Alaska 2015). The Copper River delta is an important breeding area for red-throated loons (*Gavia stellata*), northern pintail (*Anas acuta*), scaup (*Aythya* spp.), red-necked phalarope (*Phalaropus lobatus*), rusty blackbirds (*Euphagus carolinus*), and many other waterfowl, seabirds, and shorebirds.

### **a. Waterfowl**

Nearly the entire population of dusky Canada geese (*Branta canadensis occidentalis*) nests on the Copper River delta; many trumpeter swans (*Cygnus buccinator*) nest, rear, and stage in the area; and Tule white-fronted geese (*Anser albifrons elgasi*) stage in the Gandil River area north of Controller Bay.

#### **i. Dusky Canada Goose**

The dusky Canada goose (*Branta canadensis occidentalis*) is a subspecies of the Canada goose that breeds in the Copper River delta, Prince William Sound, and on Gulf of Alaska islands, including Middleton Island which is about 75 miles southwest of the License Area. Dusky geese represent one of the smallest subspecies populations of geese in North America. They are a medium-sized Canada goose with a dark brown breast and back, black head, and white strap below their eye and beaks. They winter in Oregon and Washington and migrate to the Gulf of Alaska coast to breed. They feed on nutrient rich grasses (USFWS 2018).

The 1964 Great Alaska Earthquake caused uplift in the Copper River delta that altered low-lying salt marshes and wetlands by drying and successional change to shrub and forested habitats and increased predator access to nesting sites, collectively resulting in a decline in the goose population (Bromley and Rothe 2003). Prior to 1964, geese primarily nested on the outer western Copper River delta above the mean high tide level in saltmarsh habitats dominated by sedges, grasses, forbs, and low shrubs. As their nesting habitats became dominated by shrubs and trees, dusky geese continued to use these habitats (Maggiulli and Dugger 2011). A decline in the population from 16,000 to 6,700 in 2009 was attributed to low recruitment caused by nest and gosling predation, with bald eagles the primary predator, 70 percent, followed by brown bears, 13 percent, and then wolves, coyotes, mink and other birds, 5 percent (Crowley 2011). The estimated abundance of the dusky goose population in 2019 was  $18,000 \pm 2,500$  standard error, with a 10-year increasing trend of 4 percent per year (USFWS 2019b; Olson 2019).

#### **ii. Trumpeter Swan**

Trumpeter swans (*Cygnus buccinator*) are found in and around the License Area. Trumpeter swans are large, all-white birds, with an angular wedge-shaped head and a black bill, legs and feet. Males



average 28 pounds and females average 22 pounds. Trumpeter swans mate for life and begin breeding during their third, fourth, or fifth year of life. Nesting begins in early spring, typically in an undisturbed marsh or a small lake. Cygnets hatch after a 30 to 35-day incubation period, and they fledge after 11 to 15 weeks. Both the male and female swans guard the nest during this critical time. A young swan eats a high protein diet of aquatic invertebrates and will weigh 21 to 30 pounds as an adult. Trumpeter swans eat foliage, seeds, and tubers of various marsh plants during the summer, and they feed on crops and seeds from agricultural fields on their wintering grounds in the continental United States (ADF&G 2019c).

Population trends of adult and sub-adult trumpeter swans in the Copper River delta for the last year that surveys were conducted in this region exhibited a decrease of 9 percent between 2006 and 2007, which was 35 percent above the previous 28-year mean from 1978 to 2006. Fall population counts ranged between 500 and 1,300 birds since the surveys began in 1968. Based on spring 2007 surveys, habitat for 10 to 12 trumpeter swan nests may occur within the License Area (Groves et al. 2008). Statewide, trumpeter swan populations increased at a rate of 5.3 percent per year from 1968 to 2015 as they dispersed into previously unoccupied breeding habitats, remaining relatively stable from 2010 to 2015 with an estimated 22,000 swans  $\pm$  1,100 standard error (Groves 2012, 2017).

### **iii. Tule White-Fronted Goose**

Tule white-fronted geese (*Anser albifrons elgasi*) or Tule geese, a subspecies of the greater white-fronted goose, inhabit the Cook Inlet area from April through September, passing through the License Area on their spring and fall migrations. Tule geese are one of the least abundant goose populations in North America, with a 3-year average of about 14,200 birds during 2016 to 2018 (Olson 2019). The entire population is believed to nest in the upper Cook Inlet Basin (Ely et al. 2006). Studies indicate that Tule geese arrive in the Cook Inlet coastal areas and interior marshes from mid-April to early May, and then move to nesting areas. Important nesting and brood rearing habitats include freshwater wetlands in the Susitna Valley and lowlands along Cook Inlet between the Susitna and Theodore Rivers. Molting occurs in a sub-glacial lake system along the Kahltna River. Many Tule geese leave the area to molt on the Innoko and Yukon Delta National Wildlife Refuges but return to upper Cook Inlet in late July to early August where they remain until fall migration. Tule geese start to leave for winter grounds in California by early fall and are gone from Alaska by the end of September (Ely et al. 2006). During spring migration, Tule geese follow the coast during their migration north to Alaska stopping infrequently along their route. Tule geese leave upper Cook Inlet to begin their southward migration in early September spending about 6 days on average to reach fall staging areas in Oregon and California (Petrula and Rothe 2008). Tule geese have been documented using the Gandil River area north of Controller Bay during spring/fall migrations (AKNHP 2008d).

### **b. Seabirds**

The North Pacific seabird colony database documents four nesting colonies within the License Area. These colonies have been used by Aleutian terns (*Onychoprion aleuticus*), black-legged kittiwakes, glaucous-winged gulls, common murrelets, arctic terns, black oystercatchers (*Haematopus bachmani*), tufted puffins, and pelagic cormorants (*Phalacrocorax pelagicus*). The four colonies include less than 0.5 percent of the total populations of these seabirds, except for Aleutian terns with 12.2 percent of the population at one colony in the License Area. The colonies are not

regularly surveyed, and dates for observations area one colony from 1974, one colony from 1976, and two colonies from 2002 (USFWS 2012). The East Copper Delta Colonies IBA was established for 10 Aleutian tern nesting colonies, but also contains colonies of three other seabirds (Audubon Alaska 2015). Seabirds observed within 10 miles of the License Area for 15 late-March and April Pacific herring spawning surveys between 2010 to 2019 ranged from 1,290 to 69,000 birds including: 930 to 69,000 gulls, 0 to 1,500 sea ducks, 0 to 1,000 alcids, 0 to 20 murrelets, and 0 to 3 bald eagles (Haught and Moffitt 2020).

#### ***i. Aleutian Tern***

Aleutian terns (*Onychoprion aleuticus*) breed in Alaska and eastern Siberia, with one nesting colony historically occurring in the License Area. In Alaska, Aleutian terns often nest in association with arctic terns, and the two species are difficult to differentiate from a distance. Aleutian terns are medium-sized terns, slightly larger than arctic terns, with a black cap and stripe through their eyes, white forehead, and black bill and legs. They construct nests in a depression in vegetation on the ground in a variety of habitats including grass and sedge meadows, coastal marshes, and on islands (Denlinger 2006a). Aleutian terns breed between May through August, usually laying two eggs. They incubate their eggs for 20 to 29 days, and juvenile birds fledge in 25 to 31 days. They feed on fish, invertebrates, and insects. Winter range for Aleutian terns is poorly known, but they have been observed in and around coastal waters near Singapore, Indonesia, and Hong Kong. Predators of eggs and chicks include mink, bears, and other birds. The number of Aleutian terns breeding in Alaska is estimated at 9,500 birds. Although the population is not monitored, Aleutian terns are thought to be declining (Denlinger 2006a).

#### ***ii. Murrelets***

Murrelets are small diving seabirds that belong to the alcid family, along with puffins, murrelets, and guillemots. Murrelets of conservation concern in south-coastal Alaska include the Kittlitz's murrelet (*Brachyrampus brevirostris*) and the marbled murrelet (*Brachyrampus marmoratus*). These murrelets are similar in size shape and plumages and both are common spring through fall in the south-coastal region, with Kittlitz's murrelets uncommon and marbled murrelets common in winter (Denlinger 2006b, c). Unlike most seabirds, these murrelets are not colonial nesters.

**Kittlitz's murrelets** occur near core breeding areas in Icy Bay, Yakutat Bay, the Malaspina Forelands, and Prince William Sound from June through August (Denlinger 2006b). Kittlitz's murrelets spend their summers in nearshore waters and nest on sparsely-vegetated or unvegetated scree fields, talus slopes, and coastal cliff and rock ledges (USFWS 2013). One egg is laid in June, eggs hatch in July, and young fledge in August. Kittlitz's murrelets feed on fish, euphausiids, amphipods, and small crustaceans; and key prey include Pacific sand lance, Pacific herring, capelin, and Pacific sandfish. They move to small bays along the Alaska Peninsula and Bering Sea before moving north into the Chukchi and Beaufort seas. Kittlitz's murrelets use open water leads in the sea ice in the Bering Sea and offshore waters in the northern Gulf of Alaska in winter. Kittlitz's murrelet, with an estimated population range between 26,000 to 42,000 birds, is found from southeast Alaska to the Russian Far East, with 95 percent of the population breeding in Alaska. For Kittlitz's murrelet populations with sufficient data, there may have been a decline between 1989 and 2000, but since then populations have stabilized or may be declining at a much slower rate (78 FR 61764 ; USFWS 2013).

**Marbled murrelets** are common throughout south-coastal Alaska, with breeding concentrations in the Kodiak Archipelago, Prince William Sound, and the Alexander Archipelago (Denlinger 2006c; Piatt et al. 2007). Beginning in early April, marbled murrelets migrate from wintering areas to coastal inlets and bays for breeding with nesting beginning in May. They nest on the moss-covered limbs of mature coniferous trees, though some nests in Alaska have been found on moss covered rock ledges. The female lays one egg and she and the male take turns incubating it for 28 to 30 days. After hatching the parents feed the chicks three to five times a day over the next month. They are primarily nearshore foragers at depths to 100 feet and eat capelin, Pacific herring, Pacific sand lance, and crustaceans. Young murrelets begin fledging in July and peak fledging occurs around the first week of August. Surveys show that about 25 percent of the summer population is present in March; researchers do not know where most of the birds go to molt and spend the winter. Marbled murrelets live an average of 10 to 15 years (ADF&G 2020d). In 2006, the Alaska population was estimated at 270,000 birds, with multiple lines of evidence indicating a rapid and widespread decline in murrelets of about 70 percent over the past 25 years. In Alaska threats to marbled murrelets include oil spills, salmon gillnet fisheries, logging of old growth forests, and predation by increasing populations of bald eagles (*Haliaeetus leucocephalus*), common ravens (*Corvus corax*), and Steller's jays (*Cyanocitta stelleri*; Piatt et al. 2007).

### **iii. Pigeon Guillemot**

Pigeon guillemots (*Cepphus columba*) are medium-sized diving seabirds common in south-coastal Alaska year round (Denlinger 2006d). Breeding birds are black with a white wing patch, have a thin straight bill, and are about 12 inches long and weigh around 17 ounces. Pigeon guillemots nest singly or in small colonies along rocky coastlines. They begin returning to their Alaskan breeding grounds in April and begin courtship by May. Their breeding season is May through August, and they will nest both onshore and on islands, laying one to two eggs, incubating for 26 to 33 days, with young fledging between 29 and 54 days. Pigeon guillemots feed in nearshore waters on sand lance, herring, smelt, shrimp, blennies, sculpins, and gadoids. Unlike the murrelets that forage within the water column, guillemots dive to the seafloor to forage, typically in water depths less than 65 feet (Kuletz 1998; Woodford 2008). Pigeon guillemots are widespread throughout the Pacific coast with an estimated total population of about 235,000 birds with at least 50 percent breeding in Alaska (Denlinger 2006d). The regional trend for Northern Gulf of Alaska pigeon guillemots was increasing by  $\geq 3$  percent per year between 2009 and 2018 (Dragoo et al. 2019).

### **iv. Red-Faced Cormorant**

Red-faced cormorants (*Phalacrocorax urile*) are a medium sized cormorant that occur year-round in the license area and are considered common in south-coastal Alaska. Breeding birds have bright red facial skin, and are slightly larger, but very similar in appearance to the more abundant pelagic cormorants (*P. pelagicus*). They nest on cliffs from May to August laying two to four eggs that are incubated for 27 to 34 days, with young fledging within 40 to 60 days. They feed by pursuing their prey underwater and their preferred prey are solitary fish or invertebrates found near the bottom. During the winter these two cormorant species are nearly identical (Denlinger 2006e). Record of a breeding colony of red-faced cormorants on Okalee Spit from 1967 was unconfirmed by later surveys (USFWS 2012). Movement of colony locations may result in high variation in population estimates between years (Denlinger 2006e).

The size of the breeding population has been roughly estimated at about 155,000 individuals, with the Alaska breeding population estimates at between 10,000 and 20,000 breeding birds (AKNHP 2008b; Denlinger 2006e). Red-faced cormorants nesting in the northern Gulf of Alaska had higher than average productivity in 2018, but through Alaska red-faced cormorants had a negative population trend of more  $\geq 3$  percent per year between 2009 and 2018 (Dragoo et al. 2019).

#### **v. Short-Tailed Albatross**

The North Pacific Ocean is foraging range for the short-tailed albatross (*Phoebastria albatrus*), although their occurrence in south-coastal Alaska is considered casual or accidental (Denlinger 2006f). Recent tracking data indicates that south-coastal Alaska, offshore at the shelf break from the License Area, is a core use area (50 percent kernel) for immature short-tailed albatrosses (USFWS 2014b). Short-tailed albatross are the largest seabird in the North Pacific with a wingspan of over seven feet. They are distinguished by their large pink bill with a blue tip. They breed on islands near Japan but spend the majority of their time flying low over the ocean, coming on land only to nest (USFWS 2011). Short-tailed albatross mate for life, reaching sexual maturity at six to eight years, and live for up to 45 years. They nest on volcanic ash or grassy terraces on several southwest Pacific islands with about 60 percent nesting in a single colony off Japan (USFWS 2014b). Nesting pairs typically returning to the same nest site. They feed from the surface of the ocean and typically eat crustaceans, squid, and fish (ADF&G 2018b).

Alaska placed the short-tailed albatross on the state endangered species list in 1972 after the species was harvested to near extinction by feather hunters in the early 1900s (ADF&G 2018l). The USFWS listed the short-tailed albatross as endangered throughout its range on July 31, 2000 (65 FR 46643). As of 2014, the population was estimated at 4,350 birds including an estimated 1,930 breeding age birds. Current threats to short-tailed albatross off Alaska include bycatch in commercial longline fisheries, ocean contaminants, and oil spills (USFWS 2014b).

#### **c. Shorebirds**

An estimated 12 million shorebirds, from 36 species stop along the Copper River delta each spring on their way to nesting grounds (ADF&G 2020b). The Copper River Delta IBA is recognized as being of Hemispheric Importance by the Western Hemispheric Shorebird Reserve Network and serves as single most important stopover site for western sandpipers (*Calidris mauri*) and the Pacific population of the dunlin (*Calidris alpina pacifica*) in spring. The Copper and Bering river deltas support the largest spring concentration of shorebirds in the western hemisphere (ADF&G 2006). Key shorebirds using the Controller Bay area during spring migration in order of importance include marbled godwits (*Limosa fedoa beringiae*), red knots (*Calidris canutus roselaari*), dunlin, and western sandpipers (ASG 2019). Recent studies have found that all six satellite tagged marbled godwits staged at Controller Bay (Ruthrauff et al. 2019), and the majority of radio tagged red knots were detected at Controller Bay during spring migrations (Bishop et al. 2016).

##### **i. Dunlin**

The entire Pacific coast population of dunlin (*Calidris alpina pacifica*) migrates through and rests on the Copper River delta and the wetlands in and around the License Area on their way to their northern nesting grounds (ASG 2019; ADF&G 2020b). Dunlin are a type of sandpiper and a common shorebird with a reddish-black belly and a long drooping bill. They are approximately 7

inches long and weigh around 2 ounces. They breed in coastal sedge-dwarf tundra in northern Alaska and on the Arctic coast of Canada and nest on the ground. Dunlin typically lay three to five eggs in a nest. They are ground foragers and feed on aquatic invertebrates in coastal mudflats (Cornell Lab of Ornithology 2019a). The Pacific coast population of dunlin is estimated at 550,000 birds and is considered stable and of moderate conservation concern (ASG 2019).

## **ii. Marbled Godwit**

A geographically distinct population of marbled godwits (*Limosa fedoa beringiae*) migrates through and rests on the Copper River delta and the wetlands in and around the License Area on their way to their nesting grounds (ASG 2019). Marbled godwits are a large, long-legged shorebird with a long, slightly upturned bicolored bill. They range from 16 to 18 inches long and weigh from 10 to 16 ounces. The Alaska population has shorter wings, and are heavier than the population breeding in the Great Plains (Cornell Lab of Ornithology 2019b). The Alaska population breeds across a small section of the central Alaska Peninsula and winters at coastal sites in the Pacific Northwest (ASG 2019). Multi-year telemetry studies show that marbled godwits frequently stop at Controller Bay (14 of 17 migrations, 82 percent) remaining for 1.2 to 6.0 days during spring migrations, although Controller Bay was not used during fall (22 migrations). Spring migration timing was variable over the 8 years of study with birds beginning northward migrations between 13 April and 4 May arriving at breeding sites between 29 April and 22 May (Ruthrauff et al. 2019). Marbled godwits typically lay three to five eggs in a nest. They feed on aquatic invertebrates, earthworms, insects, aquatic plant tubers, leeches, and small fish by probing soft substrates with their bill, often submerging their head or picking prey from the surface (Cornell Lab of Ornithology 2019b). The Alaska population of marbled godwits is estimated at 2,000 birds and based on the small population size, limited annual distribution, and reliance on a few key stopover sites is considered of high conservation concern (ASG 2019).

## **iii. Red Knot**

The subspecies of red knots (*Calidris canutus roselaari*) that occurs in Alaska breeds on Wrangel Island, Russian and in northwestern Alaska where they occur in low densities in montane habitats across the Seward Peninsula north to the western Brooks Range. Recent telemetry studies suggest that the entire subspecies concentrates in the Bering River and Copper River deltas (ASG 2019). Red knots are a large stocky sandpiper with a straight, medium length bill, and short legs with orange below and a complex pattern of gold, buff, rufous and black above. They are approximately 9 to 10 inches long and weigh around 4 to 7 ounces. They nest in dry upland areas with sparse vegetation usually near wetlands. Red knots typically lay three to four eggs in a nest. They feed on aquatic invertebrates in coastal mudflats, especially mussels and their larvae, clams and cockles; during nesting they feed on seeds and shoots of graminoids switching to invertebrates when they become available (Cornell Lab of Ornithology 2019c). The proportion of the subspecies breeding in Alaska is not known, the total population is estimated at 21,800 birds with a moderate or suspected decreasing trend. Because of their small population size and restricted number of sites used during migration, and suspected population declines, the roselaari red knot is considered of high conservation concern (ASG 2019).

#### ***iv. Western Sandpipers***

Western sandpipers (*Calidris mauri*) are one of the most common shorebirds in North America estimated at about 3.5 million birds, and all migrate through the Copper River delta and the License Area on the way to northern nesting grounds (ASG 2019; ADF&G 2020b). They stop at numerous sites but congregate at a few key sites with over 80 percent of the Pacific Flyway population using the Copper River delta each spring (ASG 2019). They are a small, thick-bodied shorebird that has a long black bill. They are approximately 6 inches long and weigh around 1 ounce. They vary in color depending on the season and breeding status. They breed in coastal sedge-dwarf tundra in northwestern Alaska and nest on the ground. Western sandpipers typically lay three to five eggs in a nest. They are ground foragers and feed on aquatic invertebrates in coastal mudflats (Cornell Lab of Ornithology 2019d). Western sandpipers show a suspected or moderate decreasing population trend, and in combination with their tendency to concentrate at a few key sites during migration are rated a moderate conservation concern (ASG 2019).

#### **d. Raptors and Landbirds**

Bald eagles (*Haliaeetus leucocephalus*) nest along the coast and islands in the License Area. Three landbirds of conservation concern because of declining populations (Rosenberg et al. 2016) potentially nest in coastal forests in the License Area: chestnut-backed chickadee, *Poecile rufescens* (AKNHP 2008a); olive-sided flycatcher, *Contopus cooperi* (AKNHP 2007); and rufous hummingbird, *Selasphorus rufus* (AKNHP 2008c).

##### ***i. Bald Eagles***

Bald eagles (*Haliaeetus leucocephalus*) are widely distributed along coastlines and inland waterways and are present throughout the License Area. Up to 1,500 eagles congregate on the Copper River delta during eulachon spawning (Bowman 1999). The bald eagle is characterized by a white head and tail, yellow beak, and dark brown bodies. They are the largest resident bird of prey in Alaska weighing between 8 and 14 pounds. They prefer to nest in Sitka spruce, western hemlock, and yellow cedar near the coast, and use cottonwoods and white spruce inland near rivers and lakes (ADF&G 2008b). Bald eagles begin building or repairing nests in March and April, laying one to three eggs in mid to late April. Incubation lasts 35 days and begins when the first egg is laid. Chicks fledge after about 75 days. Bald eagles reach sexual maturity at about 4 or 5 years of age. Eagles consume a varied diet composed primarily of fish but supplemented with alternative prey such as snowshoe hares, ducks, geese, gulls, kittiwakes, young sea otters, and seals. In the Copper River delta, eagles are primary predators of dusky Canada geese (Crowley 2011). Additionally, bald eagles are opportunistic scavengers, feeding on a wide array of carrion and anthropogenic refuse.

In 2007 the bald eagle was removed from the threatened and endangered species list, although Alaska's bald eagles were not listed and the population remains healthy (ADF&G 2018b). Bald and golden eagles are protected by the Bald and Golden Eagle Protection Act of 1940, which makes taking of eagles and disturbance of eagle nests illegal (16 U.S.C. 668–668c). Based on limited surveys the bald eagle population in Alaska is estimated at 70,500 birds and is considered to be increasing slowly and projected to remain stable (USFWS 2016). Based on the bald eagle nest atlas

10 inactive or unknown activity nest sites were documented in 1982 and 1983 within 1 mile of the License Area (USFWS 2019a).

## **ii. Landbirds**

**Chestnut-backed chickadees** (*Poecile rufescens*) occur year-round in coastal areas of southcentral Alaska. They nest in tree cavities primarily in coniferous and mixed forests, in Prince William Sound and southeast Alaska they occur in mature hemlock/spruce forests (AKNHP 2008a). Chickadees feed primarily on insects during the breeding season, and also eats fruit and seeds. Throughout their range chestnut-backed chickadees are considered vulnerable to habitat degradation from changing forest conditions and habitat loss due to urbanization. There has been an estimated 51 percent decrease in abundance of these birds in North America from the 1970 to 2014, with an estimated decrease of 2.5 percent per year over the 10-year period from 2004 to 2014 (Rosenberg et al. 2016). There are an estimated 12 million chestnut-backed chickadees in the United States and Canada; with an estimated 1 million birds in Alaska (AKNHP 2008a; Rosenberg et al. 2016). Roadside and off-road surveys in Alaska from 2003 to 2015 indicate no significant population trends, as do roadside surveys from 1993 to 2015 (Handel and Sauer 2017).

**Olive-sided flycatchers** (*Contopus cooperi*) occur throughout southeast, southcentral, and interior Alaska during breeding from mid-May to early September. They nest in primarily coniferous forest, woodland, and taiga habitats. Flycatchers feed primarily on flying insects especially honeybees, yellow-jacket wasps, and dragonflies (AKNHP 2007). Throughout their range olive-sided flycatchers are considered vulnerable to habitat degradation from changing forest conditions, due to climate change and habitat loss due to tropical deforestation. There has been an estimated 78 percent decrease in abundance of these birds in North America from the 1970 to 2014, with an estimated decrease of 3.5 percent per year over the 10-year period from 2004 to 2014 (Rosenberg et al. 2016). There are an estimated 1.9 million olive-sided flycatchers in the United States and Canada, with an estimated 270,000 birds in Alaska (AKNHP 2007; Rosenberg et al. 2016). Roadside surveys in Alaska from 2003 to 2015 indicate a declining trend of 3.4 percent per year, with surveys from 1993 to 2015 indicating a decline of 1.3 percent per year (Handel and Sauer 2017).

**Rufous hummingbirds** (*Selasphorus rufus*) occur from Cook Inlet to southeast Alaska during breeding arriving in mid-April. Breeding habitat is primarily secondary succession communities in forest openings. Hummingbirds feed on nectar, insects, and tree sap using a wide variety of flowering plants for nectar (AKNHP 2008c). Throughout their range rufous hummingbirds are considered vulnerable to habitat degradation from changing forest conditions and climate change. There has been an estimated 60 percent decrease in abundance of these birds in North America from the 1970 to 2014, with an estimated decrease of 2.0 percent per year over the 10-year period from 2004 to 2014 (Rosenberg et al. 2016). There are an estimated 19 million rufous hummingbirds in the United States and Canada; with an estimated 1.1 million birds in Alaska (AKNHP 2008c; Rosenberg et al. 2016). Roadside surveys in Alaska from 1993 to 2015 indicate no significant population trend (Handel and Sauer 2017).

### **3. Terrestrial Mammals**

ADF&G manages wildlife resources through game management units (GMUs). The License Area lies within the Gulf of Alaska Coast ecoregion and ADF&G's GMU 6A. Terrestrial mammals of importance in the License Area due to their subsistence and recreational uses include black (*Ursus americanus*) and brown (*U. arctos*) bears, moose, mountain goats (*Oreamnos americanus*), wolves (*Canis lupus*), and other furbearers (ADF&G 2006).

#### **a. Bears**

##### **i. Black Bears**

Black bears are the most abundant, widely distributed, and smallest of North America's three species of bears. They stand about 29 inches at the shoulder, 60 inches from snout to tail, weigh up to 350 pounds, and range in color from jet black to white. Black bears are distinguished from brown bears by their straight facial profile and shorter claws (ADF&G 2018c). Black bears primarily eat vegetation in early spring, with important foraging areas in GMU 6 early emergent coastal sedge meadows and avalanche chutes. Summer diets shift toward more fish, particularly salmon with berries also important in summer and fall (Westing 2014a). Black bears hibernate in the winter with most black bear dens located in forests. Mating takes place during June and July and two cubs are born in dens in January or February. Other bears, usually brown bears, are the primary predators of black bears (ADF&G 2018c).

Black bear population status in GMU 6 is assessed through harvest reports, stakeholder reports, and opportunistic observations during other wildlife surveys. Current population estimates are not available for GMU 6. Surveys from the late 1970s found the highest black bear densities in western Prince William Sound with an estimated 130 bears per 100 square miles. Densities along the Northern Gulf Coast were lower with an estimated 78 bears per 100 square miles. Based on declining harvests and stakeholder reports black bear populations in GMU 6 may be declining (Westing 2014a).

##### **ii. Brown Bears**

Brown bears are larger than black bears, have a pronounced shoulder hump and smaller ears, and can weigh up to 1,500 pounds. They use their long straight claws to dig up roots and to expose burrowing animals. They feed on sedges, grasses, horsetails, herbs, moose calves, waterfowl eggs and young, spawning eulachon, salmon, cow parsnip, ground squirrels, carrion, roots and berries. Brown bears mate from May to July. Pregnant females usually enter dens first in the fall and emerge last in the spring with their newborn cubs. Cubs are born in the den during January and February with litters of two cubs. Adult males usually enter dens last in the fall and emerge first in the spring. Den sites are usually in alpine and subalpine habitats (ADF&G 2018d). Brown bears remain on the Copper River delta all summer after descending from dens in the mountains in spring when new vegetation emerges (ADF&G 2020b). Brown bears concentrate in uplands in and around the License Area in summer and fall.

Brown bear population status in GMU 6 is assessed through harvest reports, stakeholder reports, and opportunistic observations during other wildlife surveys. Current population estimates are not available for GMU 6; although based on habitat and fish abundance coastal habitats probably



support medium densities of brown bears with 10 to 45 bears per 100 square miles. Brown bear populations in GMU 6 are considered stable (Westing 2015) .

### **b. Moose**

Moose were translocated in the western Copper River delta in the 1950s, and the population expanded into the Bering River Valley by the late 1960s and to Cape Yakataga by the mid-1970s (Westing 2014b). Moose are the largest member of the deer family, growing up to 6 feet tall at the shoulder and weighing up to 1,600 pounds (ADF&G 2017a). Female moose typically breed at 28 months and gestation lasts about 230 days and calves are born from mid-May to early June. Moose calves are weaned by fall in time for mating season in late September and early October. Moose move seasonally between calving, rutting, and wintering areas traveling a few miles to as many as 60 miles during transitions (ADF&G 2008c, 2017a). Spring recruitment surveys in GMU 6A West indicate that Kanak Island may be an important wintering area (Westing 2018a). Vegetation type, quality, and production are important components of moose habitat. In spring moose feed on grasses, graminoids and pond weeds; in summer moose feed on pond weeds, forbs, and birch, willow, and aspen leaves; and in fall and winter moose browse on willow, birch, and aspen twigs (ADF&G 2017a). Riverbanks, gravel bars, and adjacent areas provide good moose habitat because of the scouring effect of floods that produce regenerating willows and forbs (Woodford 2006).

An estimated 1,300 moose occurred in GMU 6 during 2014 based on the most recent population estimates for each subunit. In 2009, an estimate of 245 moose occurred in GMU 6A West which includes the License Area. No estimate was completed for GMU 6A West in 2014 because snow conditions were inadequate. The moose population in GMU 6A West, that includes coastal portions and islands within the License Area, has been below management objectives for many years, and may have stabilized at a lower density potentially influenced by high wolf and bear predation (Westing 2014b, 2018a).

### **c. Mountain Goats**

Mountain goats (*Oreamnos americanus*) inhabit rugged, mountainous habitats in coastal regions in southeastern and southcentral Alaska. Sexes appear similar, but males are about 40 percent larger than females. Adult female goats weigh about 180 pounds, with males averaging about 280 pounds in late summer. Breeding season occurs between late October and early December. Females give birth to a single kid in mid-late May after a 180-day gestation period. Mountain goats reproduce slowly compared to moose and females do not give birth until they are 4 years old. They may live up to 18 years, but most live less than 12 years. Mountain goats graze and browse depending on habitat and season. Goats are generalist using a wide range of foods including alder, rhizomes, new shoots of ferns, early emergent sedges, and forbs. Winter diet may include conifers, mosses, lichens, shrubs, forbs, ferns, and grasses. They summer in high alpine meadows where they graze on sedges, forbs, and low-growing shrubs. Grazing shifts to browsing as winter progresses when, blueberry, hemlock, and lichen may become important. Goats in coastal areas move seasonally from alpine summer ranges to winter ranges at or below tree line, typically in old-growth forest habitats (Westing 2014c; ADF&G 2020e).

An estimated 2,700 mountain goats occurred in GMU 6 based on the most recent counts from open hunt areas. The License Area overlaps one current hunt area RG226 that is primarily within GMU

6B but extends into GMU 6A to the Katalla River. Within GMU 6, goat densities are lowest in the 2 hunt areas within Unit 6B, with densities around 0.1 goats per square mile. Based on surveys from 2008, a minimum count of 89 goats occurred in the RG226 hunt area. Local residents and long-time hunting guides have been concerned about wolf predation, especially in lower lying areas such as the Don Miller Hills and Suckling Hills where goat populations have declined. The magnitude of predation by wolves on mountain goats in GMU 6 is unknown (Westing 2014c).

#### **d. Furbearers**

Furbearing animals trapped and hunted in GMU 6 that may use coastal and riverine habitats in the License Area include beavers (*Castor canadensis*), American marten (*Martes americana*), river otters (*Lutra canadensis*), and wolves (ADF&G 2015b, 2016c, 2017b; Westing 2013, 2018b). Furbearer populations are subject to fluctuations. Population abundance and trends are estimated from harvest data, trapper questionnaires, and track surveys. Results from trapper questionnaires are used to generate abundance indices and trends for furbearer management regions; GMU 6 is within Region II – southcentral Alaska (Spivey 2019).

##### **i. Beavers**

Beavers are generally considered common and abundant throughout their range in Alaska. They are found in forested areas and live near and within freshwater. Beavers construct dams to secure dens or lodges used for food storage, rearing, and shelter. Litters are born from late April to June, and young stay with their family for about 2 years. Beavers feed on aquatic plants, roots, grasses, and bark and as their food source is exhausted, they move to new areas (ADF&G 2018a). No trend was reported for beavers and abundance was considered scarce in the southcentral region during the 2017-2018 winter (Spivey 2019). Beavers were abundant during 2009 to 2012 in GMUs 6A, 6B, and 6C, particularly on the deltas of the Copper and Bering rivers (Westing 2013).

##### **ii. Marten**

American martens are the most widely trapped animal in Alaska. They inhabit most forested regions in Alaska and are often associated with mature and old-growth coniferous forests. They are solitary, breed in July and August, and give birth in April or May often in cavities in old-growth trees. Martens eat primarily on mice and voles, but also take small birds, eggs, berries, vegetation, and salmon carcasses (ADF&G 2020a). No trend was reported for marten populations and abundance was considered scarce in the southcentral region during the 2017-2018 winter (Spivey 2019). Marten were translocated to Kayak Island, south of the License Area, in the 1940s and were considered common there in the late 1970s (MacDonald and Cook 2009). Marten were common and appear to be stable in GMU 6 from 2009 to 2012. Marten density is variable, and the highest densities in GMU 6 may be between Cape Suckling and Cape Yakataga (Westing 2013).

##### **iii. River Otters**

River otters are found throughout Alaska. They are social, remaining in family or bachelor groups, and travel over a wide area. Breeding occurs in spring, and pups are born the next year from late January to June in subterranean burrows. River otters hunt on land, in fresh water, and in saltwater diving to depths of at least 60 feet and can remain submerged for more than 4 minutes. They eat a wide variety of animals including snails, mussels, clams, sea urchins, fish, and occasionally birds,

mammals, and vegetation (ADF&G 2020g). River otters became abundant throughout GMU 6 during the 1950s, and otter harvest fluctuates often dependent on projected pelt prices. They were common in GMU 6 from 2009 to 2012, with density estimate in areas of western Prince William Sound of 46 river otters per 100 km of shoreline (Westing 2013).

#### ***iv. Wolves***

Railroad, oil, and coal development in the Copper and Bering River deltas during the early 1900s may have reduced or eliminated wolves from hunting and trapping as access was increased into these remote areas (Westing 2018b). Wolves are social and live in packs. Wolves breed in February and March and give birth in dens in May or early June. Den sites are the center of activity until pups are able to travel with the pack, and wolves move away from den sites by mid or late summer. They are highly mobile often traveling 10 to 30 miles a day in winter (ADF&G 2008d). Mountain goats were the only ungulate prey available to wolves in GMU 6, although coastal wolves supplement their diet with salmon, beaver, rodents, and marine mammals. Introductions of Sitka black-tailed deer and moose in the mid-1900s brought additional ungulate prey. Wolves were rare in GMU 6 through the 1950s and 1960s but began to increase and disperse in the 1970s into areas with established moose populations. Wolf populations in this area stabilized during the 1990s. Wolves increased in GMU 6A during 2010 to 2015, with 24 wolves in 2014 and 31 wolves in 2015, within three independent groups. Wolves may be more prevalent in GMU 6A, however, trappers harvested about half of the number of wolves observed in both years (Westing 2018b).

## **4. Marine Mammals**

Gulf of Alaska waters in and around the License Area provide seasonal or year-round habitat and migration routes for marine mammals. Marine mammals potentially occurring within or near the License Area are listed in Table 4-1. Because most oil and gas activity within the License Area would be limited to between November 1 and March 31, marine mammals that are most susceptible to cumulative impacts from oil and gas exploration, development, and production within the License Area are those that remain in the region year-round. Descriptions below include key resident and Endangered Species Act (ESA) protected marine mammals. All marine mammals are protected under the Marine Mammal Protection Act (MMPA). The MMPA established a national policy to ensure that marine mammal species and populations remain significant functioning elements within their ecosystems.

Table 4-1. Marine mammals potentially present in or near the License Area.

Common and Scientific Names	ESA Listed / CH	CH in License Area	Marine Habitat Use	Seasonal Occurrence
Northern Sea Otter Southcentral DPS / stock <i>Enhydra lutris kenyoni</i>	No	No	Nearshore, Beaches and Rocky Shorelines	Year-round
<b>Pinnipeds</b>				
California Sea Lion <i>Zalophus californianus</i>	No	No	Nearshore, Shelf, Beaches and Rocky Shorelines	Males Migrate – Summer
Steller Sea Lion Western DPS Eastern DPS <i>Eumetopias jubatus</i>	Yes / Yes No	Yes	Nearshore, Shelf, Beaches and Rocky Shorelines	Year-round
Harbor Seal <i>Phoca vitulina</i>	No	No	Nearshore, Beaches	Year-round
Northern Fur Seal <i>Callorhinus ursinus</i>	No	No	Oceanic	Migratory – Summer
<b>Baleen Whales</b>				
Fin Whale <i>Balaenoptera physalus</i>	Yes / No	No	Deep Coastal, Shelf, Oceanic	Migratory – Summer
Gray Whale Eastern North Pacific DPS Western North Pacific DPS <i>Eschrichtius robustus</i>	No Yes / No		Nearshore, Shelf	Migratory – Year-round
Humpback Whale Hawaii DPS Mexico DPS Western North Pacific DPS <i>Megaptera novaeangliae</i>	No Yes / Yes Yes / Yes	No No No	Nearshore, Shelf, Oceanic	Migratory – Summer
Minke Whale <i>Balaenoptera acutorostrata</i>	No	No	Nearshore, Shelf, Oceanic	Migratory – Summer
North Pacific Right Whale <i>Eubalaena japonica</i>	Yes / Yes	No	Shelf, Oceanic	Migratory – Summer
<b>Toothed Whales</b>				
Cuvier's Beaked Whale <i>Ziphius cavirostris</i>	No	No	Oceanic, ≥ 3,300 feet deep	Migratory – Summer
Killer Whale <i>Orcinus orca</i>	No	No	Nearshore, Shelf, Oceanic	Resident/ Migratory Year-round
Sperm Whale	Yes / No	No	Oceanic, ≥ 650 feet deep	Migratory - Summer
Dall's Porpoise <i>Phocoenoides dalli</i>	No	No	Nearshore, Shelf, Oceanic	Year-round
Harbor Porpoise	No	No	Nearshore, Shelf, ≤ 300 feet deep	Year-round
Pacific White-Sided Dolphin <i>Lagenorhynchus obliquidens</i>	No	No	Nearshore, Shelf, Oceanic (not likely close to shore)	Migratory – Summer

Notes: CH = Critical Habitat, DPS = Distinct Population Segment, ESA = Endangered Species Act

Sources: (ADF&amp;G 2015a; Wynne 2015; NMFS 2019)

### **a. Northern Sea Otters**

Northern Sea otters in and near the License Area are assigned to the Southcentral Alaska stock. They are the largest member of the weasel family and have very dense brown to black fur that insulates them from the cold waters where they spend most all their life. They can grow up to 5 feet long and weigh up to 70 pounds. Female sea otters are sexually mature between age 2 and 5 years, producing a pup each year. Males mature between 4 and 6 years of age. Sea otters breed year-round, but in Alaska most pups are born in late spring. They are gregarious and may travel and rest in groups. They are not migratory but may move in response to food availability and seasonal weather conditions, general home ranges vary from 1.5 to less than 10 square miles. Sea otters forage in shallow coastal waters generally shoreward of the 131-foot bathymetric contour where they dive to the bottom for 1 to 2 minutes to depths from 5 to 250 feet to forage. They primarily eat sea urchins, crabs, clams, mussels, octopus, fish, and other marine invertebrates. Killer whales and bald eagle prey on sea otters, and they are harvested by Alaska Natives (ADF&G 2008b; USFWS 2014a).

Anthropogenic threats to sea otters include oil spills, pollutants, disturbance from recreational and industrial activities, disease, predation from killer whales, illegal take, and entanglement in fishing nets and crab pots. Current levels of human-caused mortality and serious injury are not expected to cause this stock to be reduced below its plausible optimum sustainable population level (USFWS 2014a). The most recent population estimate for the Southcentral stock based on surveys from 2000 to 2010 is about 18,300 animals, with an estimated 430 animals in the northern Gulf of Alaska. The best estimate for the overall trend for this stock is that it is increasing (USFWS 2014a).

### **b. Pinnipeds: Sea Lions and Seals**

#### ***i. Steller Sea Lions***

Steller sea lions in and near the License Area may belong to either the eastern or western US stocks or Distinct Population Segments (DPS). The eastern stock's breeding range is east of Cape Suckling including Southeast Alaska to California, and the endangered western stock's breeding range is Cape Suckling west to the Russian Far East. They are the largest member of the eared seal family. They are brown to reddish brown, but the color lightens towards the end of the summer. They have external ear flaps, long front flippers, and rotatable hind flippers that allow for locomotion on land. They have prominent broad foreheads and heavy muscular necks (NOAA Fisheries 2018e; Muto et al. 2019).

Male Steller sea lions can live up to 20 years and females to 30 years. The males reach sexual maturity at 3 to 7 years, but do not command territory or breeding rookeries until they are 9 to 13 years old. Females start breeding between ages 4 and 7 and are fertile for the next 2 decades. Mating occurs in June, but fertilized eggs do not implant until October; pups are born the following June. Most pups wean after one winter but may nurse for up to 3 years. Year-round prey includes walleye pollock, Atka mackerel, arrowtooth founder and cephalopods, while seasonally abundant prey includes Pacific herring, salmon, Pacific cod, eulachon, and capelin (ADF&G 2008b). Killer whales prey on Steller sea lions, they are harvested by Alaska Natives, and they are susceptible to entanglement in fishing gear.

Sea lions use haulouts as the base of their foraging activities and change haulouts with changes in seasonal concentrations of prey. They also use haulouts as nurseries (i.e. rookeries) and to rest (ADF&G 2008b). Steller sea lions haul out closest to the License Area include the Martin Islands (Fox Island) and Cape Saint Elias on Kayak Island. Steller sea lions disperse widely outside the breeding season which occurs from late May to early July and are expected to occur year-round in the License Area (NMFS 2019). The Martin Islands sea lion haulouts occur within the License Area. Critical habitat within 20 nautical miles of the Cape Saint Elias haulout extends into the License Area (58 FR 45269). Sea lions cross through and forage year-round within the License Area (NMFS 2019).

Factors potentially contributing to the steep decline and ESA listing of the western DPS Steller sea lions include: competitive effects from fishing, environmental change, disease, contaminants, killer whale predation, incidental take, and illegal and legal shooting (prior to 1972 it was legal to shoot sea lions). Additional effects include entanglement in fisheries and marine debris, and disturbance from vessel traffic. Management actions have been implemented since 1990 to promote the recovery of the western DPS Steller sea lion, including a three-nautical mile no-entry zone around rookeries, prohibitions on shooting at or near sea lions, and fishery regulations for sea lion prey species (e.g., walleye pollock, Pacific cod, and Atka mackerel). Critical habitat was established in 1993 and includes a 20-nautical mile buffer around all major haulouts and rookeries, the area around the Cape Saint Elias haulout buffer extends into the License Area (Muto et al. 2019).

The western stock declined 15 percent annually in the late 1980s and the decline continued through the 1990s at 5.4 percent per year. In the early 2000s, the population appeared to stabilize and began increasing at a rate of 1.78 percent per year for non-pups and 2.14 percent per year for pups between 2002 and 2017. The most recent population estimate for the western stock for 2017 is 54,267 Steller sea lions. Pup counts in the eastern Gulf of Alaska declined 33 percent between 2015 and 2017 and may be related to reduced prey availability due to warm ocean water in the northern Gulf of Alaska that persisted from 2014 to 2017. Population trends for Steller sea lions in the eastern Gulf of Alaska show annual increases for 2002 to 2017 of 4.21 percent for non-pups and 2.65 percent for pups. Some individuals from an estimated 28,594 sea lions in 2015 belonging to the Southeast Alaska segment of the eastern stock of Steller sea lions may move into the eastern Gulf of Alaska region to forage after the breeding season. Southeast Alaska Steller sea lions are also increasing at an annual rate of 2.33 for non-pups and 3.20 for pups between 1989 and 2015 (Muto et al. 2019).

## ***ii. Harbor Seals***

Harbor seals in and near the License Area are assigned to the Prince William Sound stock that ranges from the western end of the Kenai Peninsula east to Cape Fairweather (Muto et al. 2019). They are considered true seals because they have no external ear flap. They weigh up to 180 pounds and can reach up to 6 feet long. They have short stiff hair and typically are gray with darker gray blotches or light rings. The average life span for males is 26 years and for females is 35 years. Pups weigh about 24 pounds at birth and gain weight rapidly while nursing for about a month usually between mid-May and July. Pups are weaned about a month after birth and the female mates shortly after. The embryo's development is suspended for about 11 weeks and gestation lasts 8 to 9 months (ADF&G 2008b).

Harbor seals haulout in groups of several animals to thousands of animals. Tagging studies indicate the extent of a harbor seal's range depends on sex and age. Pups may range up to 232 miles from their birth site but more typically they stay within 62 miles. The range of an adult is less than 37 miles. Harbor seals use the northeastern Gulf of Alaska coastline for breeding, pupping, resting, and feeding. Reefs, sand and gravel beaches, sand and mud bars, and glacial, pan, and sea ice are commonly used for haulout sites. Harbor seals are sometimes found in rivers and lakes, usually on a seasonal basis (present in summer, absent in winter). Common prey includes walleye pollock, Pacific cod, capelin, eulachon, Pacific herring, sand lance, Pacific salmon, sculpin, flatfish, octopus, and squid. (ADF&G 2008b).

Haulouts provide important pupping habitat from May to July and molting habitat from June to October (ADF&G 2008a). Harbor seals occur in and around Controller Bay in significant numbers and consistently use several haulouts within the License Area for resting and pupping (NMFS 2019). The most recent population estimate for Prince William Sound harbor seals is 29,889 animals in 2011. The stock may be stable to increasing at a rate of 26 seals per year from 2007 to 2011 (Muto et al. 2019).

### **c. Baleen Whales**

#### ***i. Fin Whales***

Fin whales are found in deep, offshore waters throughout the North Pacific Ocean including in and around the License Area. They are listed as endangered throughout their range. Their name comes from their easy-to-spot fin on its back, near its tail. Fin whales have a streamlined body with a V-shaped head and distinctive coloration with black or dark brownish gray on the back and sides, white on the underside. Many fin whales have several light-gray, V-shaped chevrons behind their heads. Adult males are up to 78 feet long, and females are slightly larger than males, weighing between 50 to 70 tons. Fin whales reach physical maturity at about 25 years and can live up to 90 years. Males become sexually mature at 6 to 10 years of age and females at 7 to 12 years of age. After 11 to 12 months of gestation, a pregnant female gives birth to a single calf in tropical and subtropical areas during midwinter. Newborn calves are about 14-20 feet long and weigh 4,000 to 6,000 pounds. Calves nurse for 6 to 8 months (American Cetacean Society 2017; NOAA Fisheries 2020a).

During the summer, fin whales feed on krill, small schooling fish (including herring, capelin, and sand lance), and squid by lunging into schools of prey with their mouth open, using their 50 to 100 accordion-like throat pleats to gulp large amounts of food and water. They can consume up to 2 tons of food each day. Fin whales fast during the winter while they migrate to warmer waters (American Cetacean Society 2017; NOAA Fisheries 2020a). There are an estimated 14,000 and 18,000 fin whales in the North Pacific, including the northeast Pacific stock which is estimated at 3,168 whales and may be increasing (Muto et al. 2019; NOAA Fisheries 2020a)

#### ***ii. Gray Whales***

Two stocks of gray whales occur in the North Pacific Ocean. The western North Pacific stock feeds in the Okhotsk Sea off Sakhalin Island, Russian and off southeastern Kamchatka in the Bering Sea during summer and fall and presumably this stock wintered in the South China Sea. The eastern North Pacific stock migrates from Baja, Mexico through the Gulf of Alaska near the License Area

on its way to summer feeding grounds in the Bering, Chukchi, and Beaufort seas (Carretta et al. 2019). The License Area overlaps biologically important gray whale migration corridors: southward from November to January; and north from March to May (NOAA 2020). Gray whales are slate gray in color with white patches. They are typically covered with abrasions and scars and clusters of barnacles. Adult gray whales average 45 feet long and weigh 30 to 40 tons. They reach sexual maturity between 5 and 11 years and live an estimated 50 to 60 years. Females give birth to one calf every 2 or more years and gestate for 12 to 13 months. Calves nurse for 7 to 8 months (ADF&G 2008b).

Gray whales are bottom feeders that scoop up sediment from the ocean floor filtering out small invertebrates with their baleen. They eat primarily amphipods, feeding almost exclusively during the summers, rarely feeding during migration. They are generally slow swimmers, averaging 3 to 5 miles per hour during migration. The eastern North Pacific stock typically begins its migration north from late February to May. They begin their southern migration in mid-October (ADF&G 2008b). Although gray whales from either stock may occur near the License Area, gray whales observed in this region most likely belong to the much more numerous eastern North Pacific stock. The eastern North Pacific stock is estimated to contain 26,960 whales while the western North Pacific stock is estimated at 290 whales and both stocks are considered to be increasing (Carretta et al. 2019).

### ***iii. Humpback Whales***

Humpback whales are found throughout the world's oceans (Muto et al. 2018). Humpback whales from three DPSs may occur in the License Area during the summer. The western North Pacific DPS winters from the South China Sea through the Philippines; the Hawaii DPS winters around Hawaii; and the Mexico DPS winters off Mexico. Humpback whales migrate between wintering areas in Asia, Hawaii, or Mexico where they calve, and summer feeding areas in the North Pacific and Gulf of Alaska potentially including the License Area (ADF&G 2008b). No biologically important feeding areas for humpback whales occur in the License Area.

Humpbacks have a robust body shape that becomes slender towards its tail. They are primarily black in color and have a broad rounded head with knobs on the lower jaw. Humpback whales live about 80 to 90 years and reach sexual maturity between 4 and 10 years. Females produce calves every 2 or 3 years. They gestate for 11 months and bear a single calf (NOAA Fisheries 2020b).

Humpback whales migrate in the spring and the majority of central Pacific humpbacks are found along the Alaskan coast with high densities found in certain areas of their range. Humpback whales feed on euphausiids or krill, and small schooling fish (ADF&G 2008b). Whales from two DPSs that may potentially occur in the License Area are protected under the ESA (Table 4-1). The estimated total abundance for whales in the three DPSs that may occur near the License Area are 1,000 whales in the western North Pacific DPS, 10,000 whales in the Hawaii DPS, and 6,000 to 7,000 whales in the Mexico DPS. The western North Pacific DPS is considered to be increasing at a rate of 6.9 percent per year, the Hawaii DPS is increasing at a rate of 5.5 to 6.0 percent per year; and the trend for the Mexico DPS is unknown but unlikely to be declining (81 FR 62260).



#### ***iv. North Pacific Right Whales***

North Pacific right whales are the rarest of all large whale species and among the rarest of all marine mammal species. They are listed as endangered throughout their range, which includes the License Area. The North Pacific right whale has a stocky black body, sometimes with white patches on their undersides. They have no dorsal fin, a large head that is about a quarter of their body length. The tail is broad, notched, and all black (NOAA Fisheries 2018d).

Right whales likely live to at least 70 years, and probably mate around 8 years old. Females give birth to their first calf at 9 to 10 years, after a 12 to 13-month pregnancy and produce calves approximately every 3 to 5 years. Calves stay close to their mothers and are usually weaned toward the end of their first year. There are no reliable estimates of current abundance or trends for right whales in the North Pacific. The North Pacific right whale population is very small, likely in the low 100s, and most sightings have been of single whales (NOAA Fisheries 2018d). The eastern North Pacific stock, which potentially could occur near the License Area is estimated at 31 animals in 2011, with more observations in the Bering Sea than in the Gulf of Alaska (Muto et al. 2019).

#### **d. Toothed Whales**

##### ***i. Killer whales***

Killer whales are found in the Gulf of Alaska region in and around the License Area. Ecotypes of killer whales are recognized based on morphology, ecology, genetics, and behavior that include resident, transient, and offshore types. They are highly social and live in social groups called pods, with most pods in Alaska with less than 40 animals. Distribution and movements of resident and transient stocks composed of multiple pods overlap and both ecotypes could occur in or near the License Area (Muto et al. 2019). Killer whales are long-lived and reproduce slowly, and both sexes have multiple breeding partners throughout their lifetimes. Killer whales are mostly black with white patches under their jaw and under each eye and along their bottom sides. They have a tall dorsal fin reaching up to 6 feet tall on males and up to 3 feet on females (ADF&G 2008b). Killer whales have no natural predators, however, sources of human-caused serious injury and mortality include ship strikes and fishery interactions (Muto et al. 2018).

Male killer whales live for about 30 years and as long as 60 years; females live for about 50 years and up to 90 years. Females reach sexual maturity when they are between 10 and 13 years old. Young are born every 5 years and gestate for 15 to 18 months (NOAA Fisheries 2018c). In the North Pacific, most births appear to occur between fall and spring. Killer whales are top predators often hunting cooperatively, similar to wolf packs. Transient killer whales prey primarily on marine mammals and do not typically feed on fish. Resident whales feed on a variety of fish such as salmon, herring, halibut, and cod (ADF&G 2008b). Killer whales from multiple resident and transient stocks with a total of about 3,000 whales may move through the License Area. Population trend varies by stock: Alaska resident stock with 2,347 animals shows some pods increasing but the overall trend is unknown; eastern North Pacific Northern resident stock with 261 animals appears to be increasing; eastern North Pacific, Gulf of Alaska, Aleutian Islands, and Bering Sea transient stock with 587 animals is stable in Gulf of Alaska; and AT1 transient stock with 7 animals, declined from 22 to 7 whales following the Exxon Valdez spill and is currently showing no recruitment (Muto et al. 2019).

***ii. Sperm Whales***

Sperm whales are the largest of the toothed whales and have one of the widest global distributions of any marine mammal species. They are listed as endangered throughout their range which includes the License Area. They are named after the waxy substance, spermaceti, found in their heads which was used in oil lamps, lubricants, and candles. Sperm whales are mostly dark grey, though some whales have white patches on the belly. Their heads are extremely large, accounting for about one-third of total body length. The skin just behind the head is often wrinkled. Their lower jaw is narrow and the portion of the jaw closest to the teeth is white. The interior of the mouth is often bright white as well. There are between 20 and 26 large teeth in each side of the lower jaw but the teeth in the upper jaw rarely break through the gums (NOAA Fisheries 2020c).

Sperm whales hunt for food during deep dives that routinely reach depths of 2,000 feet and can last for 45 minutes. They are capable of diving to depths of over 10,000 feet for over 60 minutes. After long, deep dives, individuals come to the surface to breathe and recover for approximately 9 minutes. Their diet consists of many larger species that occupy deep ocean waters including squid, sharks, skates, and fish. Sperm whales can consume about 3 to 3.5 percent of their body weight per day. Female sperm whales reach sexual maturity around 9 years of age when they are roughly 29 feet long. At this point, growth slows, and they produce a calf approximately once every 5 to 7 years. After a 14 to 16-month gestation period, a single calf about 13 feet long is born. Although calves will eat solid food before one year of age, they continue to nurse for several years. Females are physically mature around 30 years and 35 feet long; at which time they stop growing (NOAA Fisheries 2020c). The most recent abundance estimate for the North Pacific stock of sperm whales is 345 animals from 2015 for the Gulf of Alaska only and there is no reliable trend in abundance (Muto et al. 2019).

***iii. Dall's Porpoises***

Dall's porpoises are widely distributed across the entire North Pacific Ocean with one stock, the Alaska stock, occurring in Alaskan waters and the License Area. Dall's porpoise can be found in offshore and onshore waters and are commonly found in sounds and inland passages. They prefer deep water and will use underwater canyons and deep channels to approach the coast. Dall's porpoises are mostly black with large white sections on the sides, belly, on the edges of the flukes, and around the dorsal fin. Adults weigh about 300 pounds and average 6.4 feet long. They are present year-round but may make seasonal onshore-offshore movements and winter movements out of Prince William Sound and areas in the Gulf of Alaska (ADF&G 2020c).

Dall's porpoises travel in groups of 10 to 20 but can reach groups of 100 to 200. Females mature at 3 to 6 years and males mature at 5 to 8 years. After a 12-month gestation, a single calf is born during mid-summer. Lactation lasts 2 to 4 months and Dall's porpoise usually calve every 3 years. The average life span is 16 to 17 years. They generally forage at night and eat a wide variety of prey, such as squid and small schooling fishes including capelin, lantern fish (*Myctophids*), and herring (ADF&G 2020c). The most recent abundance estimate is 11,143 animals from 2010 and there is no reliable trend in abundance (Muto et al. 2019).

***iv. Harbor Porpoises***

Harbor porpoises are widely distributed and may be locally abundant (NOAA Fisheries 2014). Those occurring in the License Area belong to the Gulf of Alaska stock, one of three stocks found in Alaska. They are found in fjords, bays, harbors, estuaries, and large rivers. They have a dark grey or brown body that fades to a lighter grey on the sides and have small flippers and a smaller beak. They can weigh up to 130 pounds and grow as long as 6 feet (ADF&G 2008b). Harbor porpoises make inshore-offshore seasonal movements that may be related to prey or ice conditions (NOAA Fisheries 2014).

Harbor porpoises are usually found singly, in pairs, or in groups of up to 10. Little is known of their reproductive behavior, although mating occurs in summer and births occur between May and July (NOAA Fisheries 2014). Sexual maturity is reached after 3 to 4 years of age and females can give birth every 2 years after a gestation period of approximately 11 months. The life span of a harbor porpoise is generally 8 to 10 years but can be up to 20 years. They feed on a wide variety of fish and cephalopods, including cod, herring, pollock, sardines, whiting, squid, and octopus (ADF&G 2008b). The most recent abundance estimate for the Gulf of Alaska harbor porpoise stock is 31,046 animals (Muto et al. 2018).

Harbor porpoise are wary and easily disturbed by boat traffic, and susceptible to fishery interactions, physical modifications of nearshore habitats resulting from urban and industrial development and activities (e.g., construction of docks and other over-water structures, filling of shallow areas, dredging, and noise) (Linnenschmidt et al. 2013; Muto et al. 2016).

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# Chapter Five: Current and Projected Uses

## Contents

	<b>Page</b>
A. Designated Habitat Areas .....	5-1
1. State Game Refuges, Critical Habitat Areas, and Other Designated Areas.....	5-1
a. Marine Parks .....	5-1
b. Copper River Delta State Critical Habitat Area .....	5-1
c. Yakataga State Game Refuge .....	5-2
d. Bering River-Controller Bay Trumpeter Swan Management Area .....	5-3
e. Copper River Delta Fish and Wildlife Management Area.....	5-3
2. Federal Designated Habitat Areas.....	5-3
a. ESA critical habitats .....	5-3
b. EFH designated habitats – marine/freshwater.....	5-4
B. Current and Projected Uses in the License Area.....	5-4
1. Subsistence and Personal Use .....	5-5
2. Commercial Fishing .....	5-7
a. Salmon .....	5-7
b. Pacific Herring .....	5-10
c. Groundfish .....	5-10
d. Shellfish .....	5-11
3. Sport Fishing.....	5-12
a. Angler Effort and Economics .....	5-12
b. Freshwater Fisheries .....	5-13
c. Saltwater Fisheries .....	5-13
d. Shellfish .....	5-14
4. Hunting and Trapping .....	5-14
5. Other Uses .....	5-17
a. Recreation and Tourism.....	5-17
b. Forestry .....	5-18
c. Mining.....	5-18
d. Oil and Gas .....	5-18
C. References .....	5-19

## Figures

	<b>Page</b>
Figure 5.1. Critical Habitat Area and Anadromous Rivers in and adjacent to the License Area.....	5-2
Figure 5.2. Gulf of Alaska Game Management Units .....	5-16

## Tables

	<b>Page</b>
Table 5-1. Bering River District drift gillnet fishery harvest and value 2015–2017. ....	5-9
Table 5-2. Nominal Prince William Sound permit values, 2000–2016 .....	5-9
Table 5-3. Nominal total Prince William Sound permit earnings, 2000–2016.....	5-9
Table 5-4. Economic impact of sport fishing in Alaska in 2001, 2003, 2006, 2011, and 2016.....	5-12



## Chapter Five: Current and Projected Uses

This chapter considers and discusses the current and projected uses in the License Area, including uses and value of fish and wildlife as required by AS 38.05.035(g)(iv). The land and waters included in and near the License Area provide habitat for many species of fish and wildlife as described in Chapter Four. The License Area also provides a variety of uses such as subsistence use, fishing, and hunting activities. In addition, the area has been used for forestry and mineral and oil and gas exploration and production. These and other current and projected uses are considered and discussed below. The following information is not intended to be all inclusive, but to provide an overview of the current and projected uses. Due to the compact size and remote nature of the exploration license, DNR has compiled the current and projected use information from the region surrounding the License Area including Prince William Sound, and southeast towards Yakutat.

### A. Designated Habitat Areas

#### 1. State Game Refuges, Critical Habitat Areas, and Other Designated Areas

The State of Alaska manages 14 marine parks, one state game refuge, one critical habitat area, and two overlapping wildlife management areas in the Gulf of Alaska area.

##### a. Marine Parks

Alaska marine parks were established to complete an international system of marine parks and recreation areas that begin in Washington State, include sites in British Columbia and Southeast Alaska, and end at Resurrection Bay. In 1983 and again in 1990, the state legislature designated marine parks in Prince William Sound (DNR 2012).

The marine parks closest to the License Area include Canoe Passage, Boswell Bay, and Kayak Island. Kayak Island is located just south of the License Area and is known as the site where the first Europeans visited Alaska. The park is seldom visited because of its remote location and inhospitable weather with exposed shoreline (DNR 2018).

##### b. Copper River Delta State Critical Habitat Area

The Copper River Delta State Critical Habitat Area (CHA) is the only state CHA in this region, and a portion of it is located within the License Area and to the west. The legislature established CHAs to protect and preserve areas crucial to the perpetuation of fish and wildlife and to restrict all other uses not compatible with that primary purpose (AS 16.20.500). They are managed by the Alaska Department of Fish and Game (ADF&G) to provide a higher level of protection to those habitats. CHAs do not prohibit oil and gas exploration or development but do require an ADF&G Special Area Permit (ADF&G 2016).

The Copper River Delta CHA is composed of land and water stretching from Hook Point on Hinchinbrook Island to Palm Point near Katalla and approximately 35 miles inland on the braided delta system. Critical migration, spawning, and rearing habitat for salmon is found throughout the

Copper River Delta CHA. In the spring, approximately 12 million shorebirds use the shores of the Copper River delta as a stopover on their way to more northern nesting grounds. Up to 250,000 shorebirds per square mile have been observed feeding on Copper River delta tide flats from late April through May. Despite the 6-foot uplift of the delta's wetlands during the 1964 earthquake and the resulting drying of some lands, the delta remains a productive summer foraging and nesting habitat for thousands of water birds (ADF&G 2016). Figure 5.1 displays the Copper River Delta CHA and anadromous rivers within and adjacent to the License Area.

### c. Yakataga State Game Refuge

The Yakataga State Game Refuge is approximately 70 miles southeast of the License Area boundary and is managed by ADF&G. The refuge's current management plan policy, from 1999, is to protect fish and wildlife, conserve their populations, and maintain public use opportunities. Non-renewable resource extraction would need to be compatible with these goals and policies and would require a Special Area Permit described in 5 AAC 95.420. Likewise, hazardous substances cannot be stored in the refuge, though amounts more than 20 gallons may be allowed by Special Area Permit. Roads, docks, pipelines and utility lines are allowed for consideration in the refuge but only under specific conditions. They may be allowed by the ADF&G commissioner if they show a need for which there is no feasible alternative. Impacts associated with development would have to be fully mitigated, up to rehabilitation and restoration (ADF&G 1999).

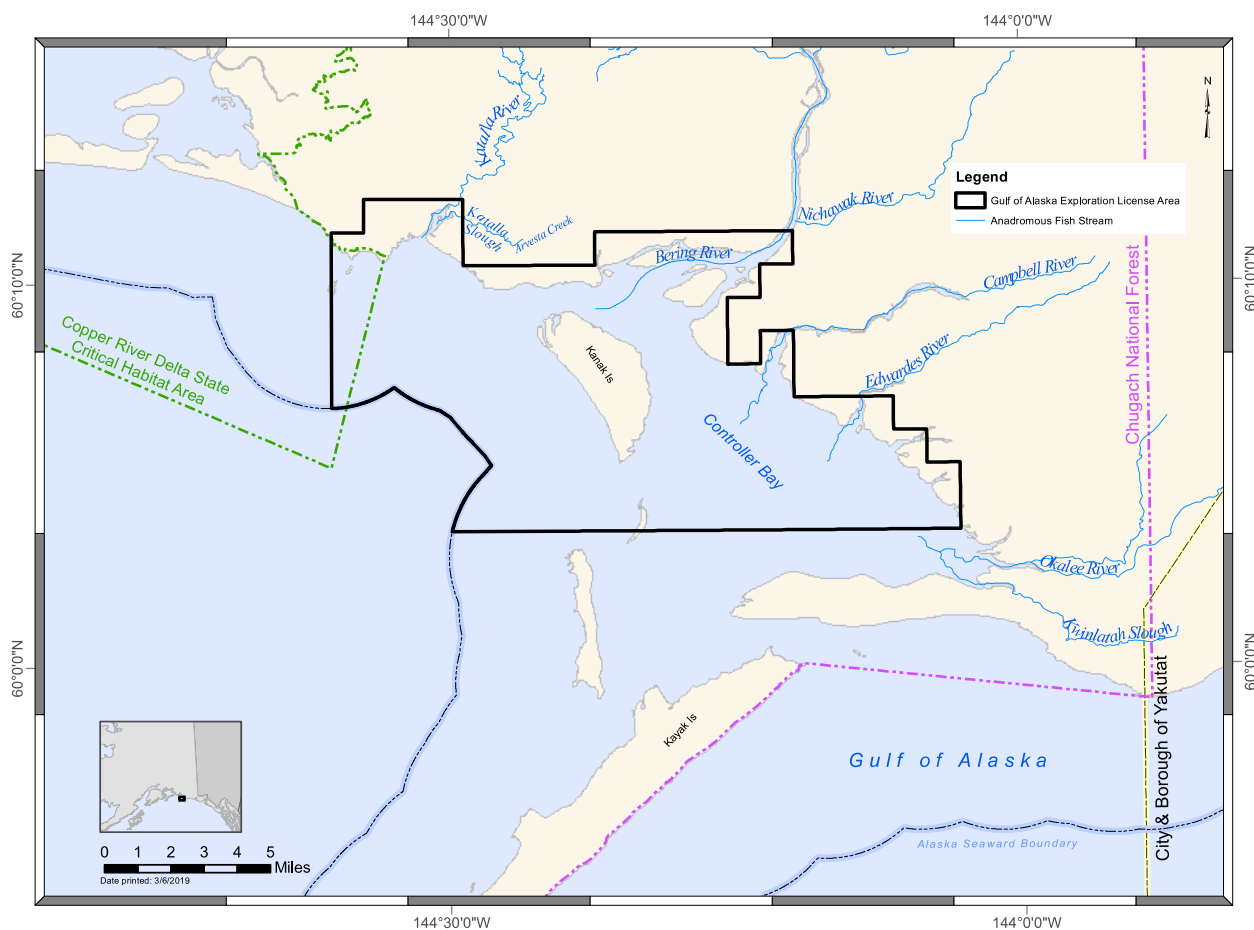


Figure 5.1. Critical Habitat Area and Anadromous Rivers in and adjacent to the License Area

#### **d. Bering River-Controller Bay Trumpeter Swan Management Area**

As described in Chapter Three, the Bering River-Controller Bay Trumpeter Swan Management Area was established in 1976 to foster cooperation in developing, managing, and maintaining fish, wildlife, and their habitats for multiple use. Impetus for establishing this management area was that it supported one of the largest concentrations of trumpeter swans in the world at that time, and provided resting and foraging habitats for large numbers of migrating waterfowl and shorebirds during spring and fall. Other notable habitats and uses mentioned in the agreement include breeding and foraging habitat for large concentrations of bald eagles; habitat for moose, bears, small game and furbearers; spawning and rearing waters for large populations of sockeye and coho salmon; and excellent waterfowl hunting, sport fishing, fur trapping, moose hunting, and out-door recreation opportunities (USFS et al. 1976). This area is covered under Management Unit 29. Katalla in the Prince William Sound Management Plan (DNR 1988) with the general management intent to protect wildlife habitat and support development of the upland resources.

#### **e. Copper River Delta Fish and Wildlife Management Area**

As described in Chapter Three, the Copper River Delta Fish and Wildlife Management Area was established in 1986 to foster cooperation in protecting, developing, maintaining, and managing the diverse fish and wildlife and their habitat in this area that encompasses both the Copper River Delta CHA and the Bering River-Controller Bay Trumpeter Swan Management Area. Notable resources and uses in this area include those listed for the Bering River-Controller Bay Fish and Wildlife Management Area and diverse habitats supporting breeding water birds and spring and fall staging for Pacific flyway waterfowl and sandhill cranes; spawning and rearing waters for Chinook and pink salmon, resident and anadromous trout, char, whitefish halibut and shellfish (USFS et al. 1986). This area is covered under Management Units 28 Copper River delta and 29 Katalla in the Prince William Sound Management Plan (DNR 1988). The management intent for Unit 28A tidelands in the CHA (the only portion of Unit 28 within the License Area) is to protect and preserve habitat areas crucial to perpetuation of fish and wildlife, and to restrict non-compatible uses while emphasizing existing recreational opportunities including hunting, fishing, and wildlife viewing (DNR 1988).

## **2. Federal Designated Habitat Areas**

### **a. ESA critical habitats**

Section 7 of the Endangered species Act (ESA) requires federal agencies to ensure that the activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of a species or to destroy or adversely modify its critical habitat. Critical habitat has no specific regulatory impact beyond a determination of whether a federally authorized or funded action may destroy or adversely modify the area (NOAA Fisheries 2020c). Steller sea lion critical habitat includes certain rookeries and haulouts and associated areas, as well as three special foraging areas. The aquatic areas surrounding major rookeries and haulout sites provide foraging habitats, prey resources, and refuge. Aquatic areas near major haulouts provide foraging and refuge habitat for non-breeding animals year-round and for reproductively mature animals during the non-breeding season. Nearshore portions of the License Area overlap with designated critical habitat within the 20 nautical mile radius of the Steller sea lion haulout at Cape Saint Elias (58 FR 45269).

Critical habitat has been proposed for Prince William Sound and the western Copper River delta west of the License Area for the Mexico Distinct Population Segment (DPS) of humpback whales (84 FR 54354). The License Area falls within Unit 9 – Northeastern Gulf of Alaska which lies between two biologically important areas for humpback whale feeding in Unit 8 – Prince William Sound and Unit 10 – Southeastern Alaska. Unit 9 is used by non-ESA listed Hawaii DPS and threatened Mexico DPS humpback whales. Unit 9 was rated of low conservation value for endangered western north Pacific DPS and threatened Mexico DPS humpback whales because available data suggests that these DPS humpback whales do not rely on this area for feeding (84 FR 54354).

### **b. EFH designated habitats – marine/freshwater**

The National Marine Fisheries Service (NMFS) defines areas of Essential Fish Habitat (EFH) for federally managed fisheries in Alaska as required by 1996 revisions to the Magnuson-Stevens Act (NOAA Fisheries 2019). EFH is habitat necessary for spawning, breeding, feeding or growth to maturity for fishes managed under federal fishery management plans. Federal agencies must consult with NMFS regarding any action that may adversely affect EFH. While state agencies are not required to consult on EFH, NMFS must provide conservation recommendations on any state action that would adversely affect EFH (NOAA Fisheries 2020b).

Text descriptions and maps are available that identify EFH for each life stage of fish under federal management (NOAA Fisheries 2019). EFH covered by three fishery management plans occurs within or near the License Area: the Salmon Fisheries Management Plan (NPFMC et al. 2012), the Gulf of Alaska Groundfish Management Plan (NPFMC 2018), and the Scallop Management Plan (NPFMC 2014). Marine and freshwater EFH for Pacific salmon is identified in the Salmon Fisheries Management Plan (NPFMC et al. 2012; NMFS 2017), freshwater EFH for Pacific salmon is regularly updated in ADF&G's Anadromous Waters Catalog (ADF&G 2020c). Marine EFH for 40 groundfishes and octopus occur within or near the License Area. The number of groundfish adults in the area increases from fall through summer with 16 in fall, 18 in winter, 24 in spring, and 31 species in summer. Vulnerable life stages in summer include eggs of 6, larvae of 11, and juveniles of 27 groundfish species (NOAA Fisheries 2020a). Early life history studies indicate that of five commercially important fishes, Pacific cod, walleye pollock, and arrowtooth flounder larvae were more abundant in the western Gulf of Alaska, while Pacific ocean perch and sablefish larvae were more abundant in the eastern Gulf of Alaska (Siddon et al. 2019). EFH for late juvenile and adult weathervane scallops occurs southwest of the license area (NOAA Fisheries 2020a).

## **B. Current and Projected Uses in the License Area**

ADF&G compiles and analyzes harvest and biological information, enabling the establishment of ecologically sound population-based fishing, hunting, and trapping regulations. This information may also be used to promote conservation strategies and recovery actions. ADF&G manages wildlife resources through game management units (GMUs). The License Area is located within the boundaries of GMU 6A. ADF&G manages commercial, sport, and subsistence fisheries by management areas. Commercial and subsistence fishing in and near the License Area is in Area E, and sport fishing is in Area J.

## **1. Subsistence and Personal Use**

Cordova, Yakutat, Chitina, Copper Center, Glennallen, Tatitlek, Valdez, Whittier, and Chenega Bay are the communities in this region nearest to the License Area most dependent on fish and wildlife for subsistence. These communities are not within the License Area and it is unknown how much of the harvest activities occur within the boundaries of the License Area. In terms of big game hunting, residents of these communities have historically hunted black bear in GMU 6. Black bear once was a staple of subsistence hunting, however, between 1986 and 2006, almost 90 percent of all black bear harvests were by nonresidents. Since then, Sitka black-tailed deer has replaced black bears in importance to Prince William Sound residents. Mountain goats continue to be a subsistence food for residents of Chenega Bay and Tatitlek, however, mountain goats are not hunted for subsistence in the License Area (Simeone 2008).

Data on the use of migratory birds and eggs for subsistence is sparse. However, in 2004 and 2010, data were collected for the Gulf of Alaska region. Researchers estimated 2,756 birds and 2,173 eggs were harvested in 2004, and 1,049 birds and 1,366 eggs were harvested in 2010. Those numbers include data from the villages of Port Graham and Nanwalek, which are closer to Homer and west of the Gulf of Alaska region (Naves and Braem 2014). More recently, the Cordova region harvested 42 birds in 2014 and reported no birds in 2015. Cordova reported harvesting 131 eggs in 2014, and an estimated 263 eggs in 2015. Harvest estimates were based on 15 completed mail surveys from 20 registered households (Naves 2016).

Between 1985 and 2003, Cordova residents annually harvested from 128 to 234 pounds per capita of non-commercial resources. In 2003, salmon was the primary subsistence resource and accounted for 44 percent of subsistence harvests among Cordova residents. Large land mammals were 30 percent of the harvests, followed by non-salmon fish at 16 percent, and a mix of marine invertebrates, birds, eggs, marine mammals, small land mammals, and vegetation making up the rest. There is typically a small harvest of razor clams east of the Copper River delta. In 2011, ADF&G issued 11 non-commercial clam harvest permits for a total reported harvest of 2.5 pounds. Subsistence users in this region harvest trout, char, whitefish, grayling, suckers, and burbot from freshwaters. Saltwater subsistence foods are salmon, shrimp, lingcod, rockfish, halibut, razor clams, golden king and Tanner crabs (Holen et al. 2011). In 2014, the estimated halibut subsistence harvest for Prince William Sound was 32,690 pounds and in 2016, approximately 26,000 pounds of halibut were harvested for subsistence (Fall and Koster 2018).

The Prince William Sound management area personal use and subsistence fisheries (including upper Copper River personal use and subsistence fisheries) harvested a total of 339,391 fish in 2015 and 232,000 fish in 2016. In 2015, combined upriver subsistence and personal use sockeye salmon harvest (federal and state) totaled 334,000 fish, exceeding the previous record harvest by more than 50,000 fish. In 2016, combined upriver subsistence and personal use sockeye salmon harvest (federal and state) totaled 232,000 fish, approximately 100,000 fish less than the previous year's record harvest. From 2005 to 2014 the combined upriver subsistence and personal use sockeye salmon harvest (federal and state) has ranged from 140,000 fish (in 2008) to 275,000 fish (in 2013), with a 10-year average of 208,000 sockeye salmon. A general increasing trend in subsistence and personal use harvest is reflected annually through additions to the in-river goal within the allocated ranges for each fishery. For these fisheries in 2015 and 2016, approximately 15,000 and 14,000

subsistence and personal use permits, respectively, were issued to Alaska residents (Haught et al. 2017; Russell et al. 2017).

In the Copper River District Subsistence Salmon Fishery, which is primarily reported from residents of Cordova, 288 permits were issued in 2015, of which 19 were not returned. Participation in 2015 was lower than the 10-year average of 372 permits, but it was greater than the historical average of 181 permits between 1965 and 2014. A harvest of 167 Chinook, 1,403 sockeye, and 10 coho salmon was reported from the 97 permits that reported fishing. The estimated salmon harvest for 2015 was below the recent 10-year average from 2005 to 2014 of 464 Chinook, 3,096 sockeye, and 22 coho salmon. The majority of the harvest, 90 percent, is historically sockeye salmon. Chinook salmon are about 10 percent with small numbers of coho salmon harvested.

Based on data available from ADF&G's Community Subsistence Information System, important resources besides salmon harvested by Cordova subsistence users include deer, moose, halibut, and vegetation including salmon berries and blueberries. In Cordova, the average household harvested an estimated 82 pounds of moose meat, 22 pounds of deer meat, and 40 pounds of halibut. Edible vegetation made up approximately nine percent of the community harvest. Cordova households reported harvesting approximately 11 pounds of vegetation (Fall and Zimpelman 2016).

In March 2008, the Board of Fisheries made a positive customary and traditional use finding for Tanner crab in Prince William Sound and subsequently opened a subsistence fishery to Alaska residents only that is monitored through a required permit system. Information is collected through permit reports on total harvest of legal male crab and the number of Tanner crab released. Since the fishery opened in 2008 there has been increasing catch and harvest. Total legal male crab caught in the fishery peaked at 3,564 crab during the 2012/2013 season (Rumble et al. 2014).

Yakutat residents use about 200 miles of coastline for subsistence. Areas especially highly used include coastal areas east of the Situk River west to Ocean Cape, all the lands and waters of the Ankau lagoon system, all areas of the shore and offshore in Yakutat Bay, and virtually all of the Situk River drainage. These areas are all outside of the License Area boundaries (City and Borough of Yakutat 2010). Between 2007 and 2016, Yakutat residents harvested annually just over 5,400 salmon of all species on average (Conrad and Gray 2018). A mid-1980s survey showed that Yakutat residents hunted seals throughout Yakutat Bay, at the entrances to major salmon streams along the Yakutat Forelands, and in Icy Bay (Hood et al. 2006). Black and brown bears are both prevalent large mammals in the Yakutat subsistence harvest. Most black bears were taken in May and all brown bears were taken in October based on 2015 data. Bears were hunted both along the road system and on the coastlines of Russell Fjord. Additional bear hunting areas include the Situk and Italio Rivers approximately 165 miles east of the License Area (Sill et al. 2017).

Subsistence harvests in Yakutat follow a yearly cycle based on seasonal availability, conditions, and regulatory restrictions. In general, eulachon appear in the Situk, Italio, and Alsek rivers in February. In February and March, clams, scallops, shrimp, and crab can be harvested from islands immediately northwest of Yakutat. Halibut and cod may also be available in the same area and are harvested all year. Herring arrive in late February or March. Winter Chinook salmon are harvested throughout the winter, with the most fish caught in March and April. Chinook are also harvested May through July. Seals are also harvested in the protected waters of these islands, with 345 harbor seals harvested in 2015 (Sill et al. 2017). In 2015, residents of Yakutat harvested about 16,000

pounds of halibut for subsistence, and about 23,000 pounds in 2016 (ADF&G 2018b; Fall and Koster 2018).

Salmon dominate summer harvest activities. The Situk River is the site of most fishing (both commercial and subsistence) in Yakutat. Most salmon fishing in 2015 occurred in the Situk River and Yakutat Bay. Sockeye and coho salmon made up the bulk of the harvest with roughly 27,000 pounds of sockeye and about 15,000 pounds of coho harvested (Sill et al. 2017). Later in the season people harvest berries, and other plants, such as wild celery, ferns and beach greens. In the autumn months of September to October, late run coho salmon are harvested, mountain goats may be hunted near Icy Bay, black bears are sought, and moose season begins. This is also the time of year for harvesting waterfowl. Trapping activities take over during the winter months, November through January (Sill et al. 2017). Trapping of furbearers occurs along the Malaspina Forelands south of Sitkagi Bluffs and the shoreline southeast of Icy Bay (Hood et al. 2006).

## **2. Commercial Fishing**

ADF&G manages commercial salmon, Pacific herring, groundfish, and shellfish fisheries within and adjacent to the License Area. The Prince William Sound management area, also known as Area E, encompasses all coastal waters and inland drainages entering the north central Gulf of Alaska between Cape Suckling and Cape Fairfield. In addition to Prince William Sound, this management area includes the Copper and Bering rivers and has a total adjacent land area of approximately 38,000 square miles. The commercial fishery with the greatest potential for direct interaction with oil and gas activities in the License Area is the Bering River District drift gillnet fishery.

### **a. Salmon**

The Prince William Sound and Copper River salmon management area is divided into 11 districts that correspond to the local geography and distribution of the five species of salmon harvested by the commercial fishery. The management objective for all districts is to achieve spawning escapement goals for the major salmon species and stock groupings while allowing for the orderly harvest of all fish surplus to spawning requirements. In addition, ADF&G follows regulatory plans to manage fisheries and allow private non-profit hatcheries to achieve cost-recovery and brood stock objectives. Six hatcheries contribute to the area's salmon fisheries, and the Gulkana Hatchery near Paxson, produces sockeye salmon for the Copper River. The other hatcheries are Armin Koernig Hatchery on Evans Island, near Chenega Bay; Main Bay Hatchery, east of Port Nellie Juan; Wally Noerenberg Hatchery, at the south end of Esther Island; and Cannery Creek Hatchery, on the east side of Unakwik Inlet. The Solomon Gulch Hatchery in Port Valdez produces pink and coho salmon (Wiese et al. 2015).

Purse seine, drift, and set gillnet gear are all used in area salmon fisheries. Of these salmon fisheries, only the Bering River District drift gillnet fishery occurs within the License Area. Drift gillnet permits were the most numerous at 518 in 2017, and operate in the Bering River, Copper River, Coghill, Unakwik, and Eshamy districts. There were 29 set gillnet permits in 2017, which were used only in the Eshamy District, in western Prince William Sound. There were 229 purse seine permits in 2017, which are allowed to fish in the Eastern, Northern, Unakwik, Coghill, Northwestern, Southwestern, Montague, and Southeastern districts (Vega et al. 2019).

The 2015 Prince William Sound management area commercial salmon harvest was 103.49 million fish. The harvest included a record 97.33 million pink, 3.4 million sockeye, 2.51 million chum, 225,000 coho, and 24,500 Chinook salmon. Approximately 95.1 million fish were commercial common property harvest, and 8.39 million fish were sold for hatchery cost recovery. Estimated value of the combined commercial salmon harvest, including hatchery sales, was approximately \$117.18 million. During the 2015 season, 520 drift gillnet, 31 set gillnet, and 220 purse seine permit holders fished. Drift gillnet exvessel harvest value was an estimated \$37.07 million (average permit earnings of \$71,300); set gillnet exvessel harvest value was an estimated \$1.98 million (average permit earnings at \$63,700); and purse seine exvessel harvest value was an estimated \$63.6 million (average permit earnings at \$289,000). Revenue generated for hatchery operations was approximately \$14.52 million (Haught et al. 2017).

The 2016 Prince William Sound management area commercial salmon harvest was 18.54 million fish. The harvest included 12.88 million pink, 1.99 million sockeye, 3.17 million chum, 483,930 coho, and 13,467 Chinook salmon. Approximately 13.33 million fish were commercial common property harvest and 5.80 million fish were sold for hatchery cost recovery. The estimated value of the combined commercial salmon harvest, including hatchery sales, was approximately \$62.64 million. During the 2016 season, 517 drift gillnet, 29 set gillnet, and 210 purse seine permit holders fished in at least one fishing period. Drift gillnet exvessel harvest value was an estimated \$34.78 million (average permit earnings of \$67,266); set gillnet exvessel harvest value was an estimated \$2.10 million (average permit earnings at \$72,466); and purse seine exvessel harvest value was an estimated \$11.55 million (average permit earnings at \$54,982). Revenue generated for hatchery operations was approximately \$14.21 million (Russell et al. 2017).

The Copper River District drift gillnet fishery is prosecuted in waters of the Gulf of Alaska between Hook Point and Point Martin and occurs adjacent to the License Area. The 2015 harvest was 22,500 Chinook, 1.75 million sockeye, and 137,000 coho salmon (Haught et al. 2017). The 2016 harvest was 12,300 Chinook, 1.18 million sockeye, and 368,000 coho salmon (Russell et al. 2017). The 10-year average commercial harvest from the Copper River District for 2005 to 2014 was 18,383 Chinook, 1.42 million sockeye, and 214,000 coho salmon. The 25-year average for 1990 to 2014 was 34,200 Chinook, 1.40 million sockeye, and 277,000 coho salmon (Haught et al. 2017).

The Bering River District drift gillnet fishery is prosecuted in waters of the Gulf of Alaska between Point Martin and Cape Suckling, and directly overlaps the License Area. This fishery has the greatest potential for interaction with oil and gas activities within the License Area. The 2015 to 2017 drift gillnet harvests for the Bering River District are listed in Table 5.1, along with the 10-year average harvest for 2007 to 2016 (Vega et al. 2019).

The value and overall earnings for Prince William Sound salmon permits has increased significantly since 2000, and in the case of the purse seine permit value, peaked in 2014 before decreasing in 2015 and 2016 (Tables 5.2 and 5.3; Gho 2017). About 33 percent of Prince William Sound purse seine salmon permits are owned by residents of the Valdez-Cordova Census Area. About 43 percent of the drift gillnet permits are locally owned, and about 14 percent of set gillnet permits are locally owned. Permit values adjusted for inflation were at an all-time high in 1990 before declining to their lowest values in the early 2000s. Between 2005 and 2012, as illustrated in Table 5.2, salmon permit values steadily increased (Gho 2017).



**Table 5-1. Bering River District drift gillnet fishery harvest and value 2015–2017.**

Salmon	10 yr Mean	2015		2016		2017		2015-2017	
		No.	Value	No.	Value	No.	Value	No.	Value
Chinook	45	13	\$1,283	52	\$5,550	36	\$5,366	34	\$4,066
Sockeye	7,187	2,137	\$23,708	9,809	\$118,669	2,578	\$41,364	4,841	\$61,247
Coho	52,330	12,106	\$64,778	80,094	\$1,064,353	119,295	\$1,368,015	70,498	\$832,382
Pink	11	10	\$6	22	\$15	105	\$111	46	\$44
Chum	18	1	\$3	122	\$465	15	\$80	46	\$183
Totals	59,591	14,267	\$89,778	90,099	\$1,189,052	122,029	\$1,414,937	75,465	\$897,922

Note: 10-year average (mean) for 2007 to 2016

Source: (Haught et al. 2017; Russell et al. 2017; Vega et al. 2019)

**Table 5-2. Nominal Prince William Sound permit values, 2000–2016**

Year	Purse Seine	Drift Gillnet	Set Gillnet
2000	\$22,000	\$59,300	\$60,500
2001	\$21,400	\$57,500	\$60,300
2002	\$20,000	\$41,000	\$59,200
2003	\$13,500	\$35,900	\$59,900
2004	\$14,000	\$40,400	\$62,800
2005	\$19,200	\$48,300	\$62,700
2006	\$26,100	\$51,600	\$61,500
2007	\$30,900	\$52,000	\$61,500
2008	\$70,200	\$90,300	\$59,500
2009	\$75,300	\$110,900	\$59,500
2010	\$100,500	\$128,100	\$59,800
2011	\$140,000	\$162,100	\$59,800
2012	\$168,700	\$180,200	\$61,000
2013	\$168,000	\$195,200	\$119,300
2014	\$213,000	\$237,500	\$190,800
2015	\$186,700	\$224,200	\$190,800
2016	\$147,900	\$155,400	\$190,800

Source: (Gho 2017)

**Table 5-3. Nominal total Prince William Sound permit earnings, 2000–2016**

Year	Purse Seine	Drift Gillnet	Set Gillnet
2000	\$18,003,064	\$20,325,656	\$1,008,002
2001	\$12,862,182	\$21,236,239	\$1,341,957
2002	\$5,166,570	\$21,026,589	\$1,726,484
2003	\$16,719,325	\$20,269,755	\$1,305,689
2004	\$5,898,622	\$22,408,577	\$499,698
2005	\$19,390,127	\$24,066,702	\$540,779
2006	\$11,413,062	\$27,497,718	\$849,458
2007	\$35,955,115	\$34,903,708	\$1,365,898

Year	Purse Seine	Drift Gillnet	Set Gillnet
2008	\$52,047,970	\$33,038,463	\$1,498,602
2009	\$10,451,033	\$32,395,561	\$1,704,971
2010	\$82,212,884	\$47,761,081	\$4,085,598
2001	\$37,692,355	\$50,157,831	\$3,215,004
2012	\$48,550,233	\$60,292,130	\$3,541,396
2013	\$100,114,897	\$52,020,760	\$2,751,731
2014	\$39,955,927	\$54,568,021	\$3,094,241
2015	\$67,368,461	\$37,828,620	\$2,038,043
2016	\$14,547,133	\$36,830,335	\$1,921,950

Source: (Gho 2017)

## b. Pacific Herring

In 1993, the spawning biomass of herring in Prince William Sound was 20 percent of what was expected, and herring numbers have not recovered since. The decline has been attributed to a massive adult die off between spring of 1992 and 1993 caused by poor nutrition, possibly in combination with disease (Pearson et al. 2012). Based on stock assessment information, all Prince William Sound Pacific herring fisheries remained closed in 2017 for the seventeenth consecutive season (Vega et al. 2019).

## c. Groundfish

Groundfish fisheries managed by ADF&G in Prince William Sound take place from Cape Fairfield to Cape Suckling, in both state and federal waters. Species managed include rockfish, Pacific cod, pollock, sablefish, and lingcod. In 2018, the state-managed groundfish harvest totaled 8.43 million pounds with a value of \$1.5 million and a 20-year average of \$1.4 million (Rumble et al. In Prep).

Pollock is the highest-volume fishery in Prince William Sound with nearly 7.7 million pounds harvested in 2018, with a value of \$830,316. This is an increase from the 2017 harvest of 4.1 million pounds with a value of \$201,980 and above the 20-year average value of \$475,581. With decreasing Pacific cod abundance in the Gulf of Alaska and Prince William Sound, the harvest and value of Pacific cod in 2018 decreased to 591,276 pounds combined for parallel and state-waters fisheries with a value of \$335,031. Parallel fisheries are managed by ADF&G concurrent with federal seasons, although harvest levels are set by NMFS. Pacific cod and pollock had similar values (within \$100,000) between 2014 and 2016 with the value of pollock increasing to \$830,316 in 2018 compared to Pacific cod, which was about \$500,000 less (Rumble et al. In Prep).

The sablefish harvest increased in 2017 and 2018 from historic lows in 2015 and 2016. In 2018, the sablefish harvest was 88,117 pounds with a guideline harvest level of 133,000 pounds and value of \$302,830. This was an increase from 2017, when the sablefish harvest was 73,113 pounds with a guideline harvest level of 117,000 pounds and value of \$329,706 (Rumble et al. In Prep).

Most lingcod harvest occurs in federal waters but is managed by the State of Alaska. Lingcod are caught as bycatch to directed groundfish fisheries and in directed longline and jig fisheries. In 2018, harvest of lingcod in the Outside District in both bycatch and directed fisheries was 29,554 pounds

with 6,688 pounds harvested from the Inside District; the total value of this harvest was \$29,619, the highest value since 2012 (Rumble et al. In Prep).

Rockfish is only harvested as bycatch in Prince William Sound and harvest remained near 60,000 pounds in 2017 and 2018, a decrease from the previous 3 years when harvest exceeded the guideline harvest level of 150,000 pounds (Rumble et al. In Prep).

#### **d. Shellfish**

Historically vibrant fisheries for Dungeness crab and other shellfish once existed in Prince William Sound and the Copper River delta. Between 1981 and 1991, harvests for Dungeness crabs ranged from 70,000 to 1.5 million pounds. The average harvest from 1983 to 1992 was 590,000 pounds among twelve vessels. The Board of Fisheries closed the crab fishery in 2000, and the likelihood of these fisheries reopening in Prince William Sound remains low. The decline of Copper River Dungeness crab stocks coincided with the collapse of other shellfish in Prince William Sound. Possible explanations for the decline and failure to recover are overfishing, bycatch, predation, and environmental changes that affect disease, growth, and larval survival (Rumble et al. 2016).

Estimates of legal male Tanner crab abundance dropped precipitously between 1993 and 1999, from approximately 100,000 legal males to a little more than 3,500 legal males. Numbers of legal males increased steadily from 2001 through 2009 to almost 80,000 crab and then reaching a high estimate in 2011 and 2013 of about 185,000 crabs with lower estimates in following years. A commissioner's permit Tanner crab fishery for eastern and western districts of Prince William Sound went into effect in 2017 and was prosecuted in 2018 and 2019 in the southwestern portion and outside waters of Prince William Sound. In 2019, most of the harvest, 83,837 pounds, came from a statistical area in the Gulf of Alaska, outside of Prince William Sound. The total harvest for the Tanner crab fishery was 83,338 pounds in 2018 and 124,707 pounds in 2019 (Rumble et al. 2019).

The Prince William Sound commercial shrimp pot season opened in 2010, after an 18-year closure following recovery of the population demonstrated by annual surveys. In 2017, just over 67,000 pounds of shrimp were commercially harvested in Prince William Sound by 61 permit holders on 54 vessels (Rumble et al. 2018). In 2019, 72 vessels participated in the fishery and in 2018, 44 vessels landed shrimp. There are three defined commercial shrimp pot fishery areas in Prince William Sound with one area open each year for commercial shrimping while the other two areas remain closed to commercial fishing; the department uses this rotation tool to aid in a sustainable fishery. There is a commercial shrimp trawl fishery prosecuted in Prince William Sound, with one or two participants in this fishery, the fishery information is confidential.

During the first part of the 1900s there was a strong razor clam industry near Cordova, with the community once touting itself as "the razor clam capital of the world". However, markets declined between the 1950s and the 1980s because of concerns for paralytic shellfish poisoning. The 1964 earthquake significantly affected the habitat of razor bed clams during that period of decline. Annual commercial harvests from 1980 to 1988 averaged 51,611 pounds by 20 diggers. The only commercial harvest to occur since 1988 took place in 1993. The results of the 1993 commercial harvest remain confidential due to only two diggers participating (Rumble et al. 2016).

Beginning in 1992, a weathervane scallop fishery opened near Kayak Island and its vicinity,

including in federal waters beyond three miles from shore. Kayak Island was divided into two separate fishing areas in 1998: West Kayak Subsection, and the East Kayak Subsection. The guideline harvest level derived from the ADF&G fishery independent survey has fluctuated since the fishery opened. During the past 10 seasons, the fishery in the Kayak Island area has been closed four seasons and has been open for six seasons with a guideline harvest level ranging from 6,300 to 20,000 pounds of shucked meat weights (Armstrong et al. 2018) .

### 3. Sport Fishing

Whittier, Valdez, and Cordova are three ports that provide access to Prince William Sound sport fishing opportunities. Some streams are accessible by road from Cordova and Valdez. For the most part, sport fisheries in Prince William Sound and the Gulf of Alaska are remote and are accessible only by plane or boat. Hundreds of lakes and streams, combined with hatchery-raised fish, provide opportunity for recreational fishers to catch salmon from May to October. Wild and hatchery Chinook salmon are fished all year in the saltwater of Prince William Sound. Shrimp, hard-shell clams, salmon sharks, trout, halibut, rockfish, and lingcod all attract recreational fishers (Blain-Roth et al. 2017). The License Area lies within the Cordova road system–Copper River delta geographic area within the Prince William Sound management area, or Area J within the Southcentral sport fish region (Blain-Roth et al. 2017).

#### a. Angler Effort and Economics

From 2009 to 2018, sport fishing throughout Alaska peaked in 2014 with 2.3 million angler-days, ranging from 1.9 to 2.3 million angler-days, with a 10-year mean of 2.1 million angler-days. During 2016, the statewide economic contribution from Alaska sport fishing for an estimated 2 million angler-days was \$1.4 billion (Table 5-4). During this period, about 66 percent of the total statewide sport fishing effort occurred in the Southcentral area, with 11 percent of the sport fishing effort in Area J – North Gulf Coast/Prince William Sound which includes the License Area (ADF&G 2020b). Economic estimates for sport fishing specific to the License Area are unavailable.

**Table 5-4. Economic impact of sport fishing in Alaska in 2001, 2003, 2006, 2011, and 2016.**

Year	Retail Sales	Output	Wages and Salaries	Jobs
2001	\$587,028,597	\$959,821,921	\$238,011,311	11,064
2003	\$640,167,515	\$1,046,706,782	\$259,556,537	12,065
2006	\$530,165,682	\$800,921,744	\$252,957,398	8,465
2011	\$718,452,401	\$1,073,716,980	\$358,679,292	9,992
2016	\$942,977,816	\$1,462,626,460	\$470,961,645	12,689

Sources: (ASA 2002; Southwick Associates, Inc. et al. 2008; Southwick Associates 2013, 2019)

Notes: Estimates use data from the US Fish and Wildlife Service's National Survey of Fishing, Hunting and Wildlife-Associated Recreation, and probably underestimate the total economic impact of sport fishing in Alaska because they do not include expenditures made outside Alaska.

Many sport anglers, particularly non-residents, use the services of sport fishing guides and charters. The guided fishing industry provides significant economic benefits to Alaska and the Prince William Sound area by providing jobs and supporting tourism. Sport fishing guides are required to be licensed and must meet minimum professional standards such as first aid training, a US Coast

Guard operator's license, a business license, and proof of insurance. In December 2014, over 1,800 guides were licensed in Alaska (Powers and Sigurdsson 2016).

In Prince William Sound, angler effort increased from 132,794 angler days to 210,188 angler days between 2001 and 2007 where it peaked. In 2013, effort was 177,434 angler days, an uptick from the 2012 season of 135,852 days which was the lowest effort for the past 15 years. Average angler effort in the Prince William Sound management area from 2014 to 2016 was 162,377 angler-days. Angler effort in Prince William Sound has mirrored statewide trends with a decrease in 2012 followed by an increase in 2013. In 2014, angler effort increased in the Copper River delta, also consistent with statewide trends. In 2016, angler effort in eastern Prince William Sound and the Copper River delta decreased, following statewide and Prince William Sound trends. Whittier held the second highest average with 46,254 days. Between 2014 and 2016, regionally, western Prince William Sound averaged the most angler days annually with 80,655, followed by eastern Prince William Sound's average of 59,348 angler days, and the Cordova Road-delta region averaged 18,712 angler days (Thalhauser 2014; Blain-Roth et al. 2017).

### **b. Freshwater Fisheries**

In the License Area, coho salmon fishing is popular in August and September. Anglers fish for pink salmon before the coho run begins and there are also cutthroat trout in the Kushtaka and Bering Rivers. Sportfishing guides operating in the Katalla area during the early-2000s brought an average of about 80 anglers per year on guided fishing trips during the 8-week coho season. Most sport fishing in the License Area is guided (USFS 2002).

Cordova has a relatively small road system that provides access to freshwater fishing opportunities to residents and tourists for sockeye and coho salmon, grayling, Dolly Varden, and trout. Anglers can access Clear and Ibeck Creeks and the Eyak River from the road system. Additionally, there are fishing opportunities in Alaganik Slough for sockeye and coho salmon. Clear Creek and Sheridan Dike Pond are the only water bodies near Cordova where Arctic grayling are reliably found as they are no longer stocked along the Copper River Highway (ADF&G 2015).

### **c. Saltwater Fisheries**

Halibut are caught throughout the marine waters of Prince William Sound. Harvests in western Prince William Sound increased after 2001 from 13,412 harvested that year to an average of 32,545 between 2011 and 2013. Harvests are higher in western Prince William Sound than in the eastern portion. The average yearly sport harvest for the Cordova area was 2,400 fish (Thalhauser 2014; ADF&G 2015). In eastern Prince William Sound in 2017, 4,090 halibut were harvested from charter vessels and 8,777 halibut were harvested from non-charter vessels. The average weight of those fish was 33.74 pounds for charter vessels and 28.04 pounds for non-charter vessels (ADF&G 2018a).

Pelagic and nonpelagic rockfish are harvested in the Prince William Sound sport fishery, with 10 species of rockfish regularly harvested in the Cordova area sport fishery. After the Whittier tunnel opened in 2000, catch and harvest of rockfish in western Prince William Sound tripled between 2001 and 2009. The 2014 to 2016 average annual catch of rockfish in the Prince William Sound management area was nearly 10,000 more fish (67,059) than the average catch for the prior 10 years, 2004 to 2013 of 57,930 fish. Since 2013, catch and harvest have increased and in 2016,

rockfish catch and harvest reached record highs of 72,303 and 55,771 fish, respectively. In 2016, 74 percent of rockfish caught and harvested were caught in western Prince William Sound whereas eastern Prince William Sound has maintained relatively stable harvests since 2001. Over 77 percent of rockfish caught in Prince William Sound in 2016 were harvested. The high retention rate could indicate an increase in targeting, possibly in response to restrictions in the charter halibut fishery (Thalhauser 2014; ADF&G 2015; Blain-Roth et al. 2017).

Lingcod are common along the ocean entrances from Cape Fairfield at the southern tip of the eastern Kenai Peninsula to Hinchinbrook Entrance and are also caught around rocky reefs and underwater pinnacles throughout Prince William Sound. From 2001 to 2007, total lingcod harvest increased from 4,586 fish to 11,961 fish and was split evenly between western and eastern Prince William Sound. The lingcod harvest remained stable until a decline began in 2010. In eastern Prince William Sound, an average of 5,040 lingcod were caught between 2004 and 2013 with 2,803 lingcod harvested. Catch dropped with 2014 to 2016 averages 3,254 lingcod caught and 1,989 harvested. Higher retention rates in recent years may reflect a decrease in the proportion of sublegal-size lingcod in the population, a preference for harvesting trophy size fish, or some combination. About 70 percent of lingcod released by anglers from 2014 to 2016 were sublegal-size (Thalhauser 2014; Blain-Roth et al. 2017).

#### **d. Shellfish**

Personal use regulations for the shrimp pot fishery were repealed in 2016 by the Board of Fisheries to simplify sport fishing regulations and reduce redundancies, and beginning in 2017 the noncommercial shrimp season consists of sport and subsistence shrimp pot fisheries in Prince William Sound (Rumble et al. 2018). Shrimp are sport/subsistence harvested mostly out of the ports of Whittier and Valdez. Whittier shrimp are primarily harvested in the areas of Passage Canal, Culross Island, and Port Wells. Shrimping effort out of Valdez focuses near Port Valdez and Valdez Arm. While waters in the License Area are open to the sport/subsistence pot shrimp fishing, no harvest has been recorded for this fishery from the License Area or the adjacent Copper River delta.

Shrimp harvest in 2002 was 15,054 pounds and was 85,988 pounds in 2013. Effort and harvest peaked in 2010 at 142,146 pounds. The average harvest and number of Prince William Sound shrimp permits issued from 2014 to 2016 was slightly higher than the prior 5-year average from 2009 to 2013, although average effort decreased. Average effort and harvest of shrimp for 2014 to 2016 was 47,272 pot-days and 94,671 pounds, respectively. Effort in 2016 was the lowest at 45,012 pot-days, since 2009 when permits were reinstituted. The low effort in 2016 can be attributed to an emergency order (EO 2-SHR-6-14-16) preseason action that reduced the maximum number of pots allowed to 4 per vessel. Even with the reduced effort, the shrimp harvested in 2016, 102,785 pounds, was the largest on record since 2002 (Thalhauser 2014; Blain-Roth et al. 2017).

### **4. Hunting and Trapping**

Hunting and trapping of black and brown bear, moose, deer, mountain goat, and various furbearers may occur in and around the License Area. The License Area is located primarily within ADF&G's GMU 6A (Figure 5.1). Due to the limited use in GMU 6A, data for this finding is compiled for areas adjacent to the License Area to reflect the use of the nearby communities. Most hunting in the

Katalla area is likely guided sport hunts in late spring for black bears, and in fall for brown bears, moose, and mountain goats (USFS 2002).

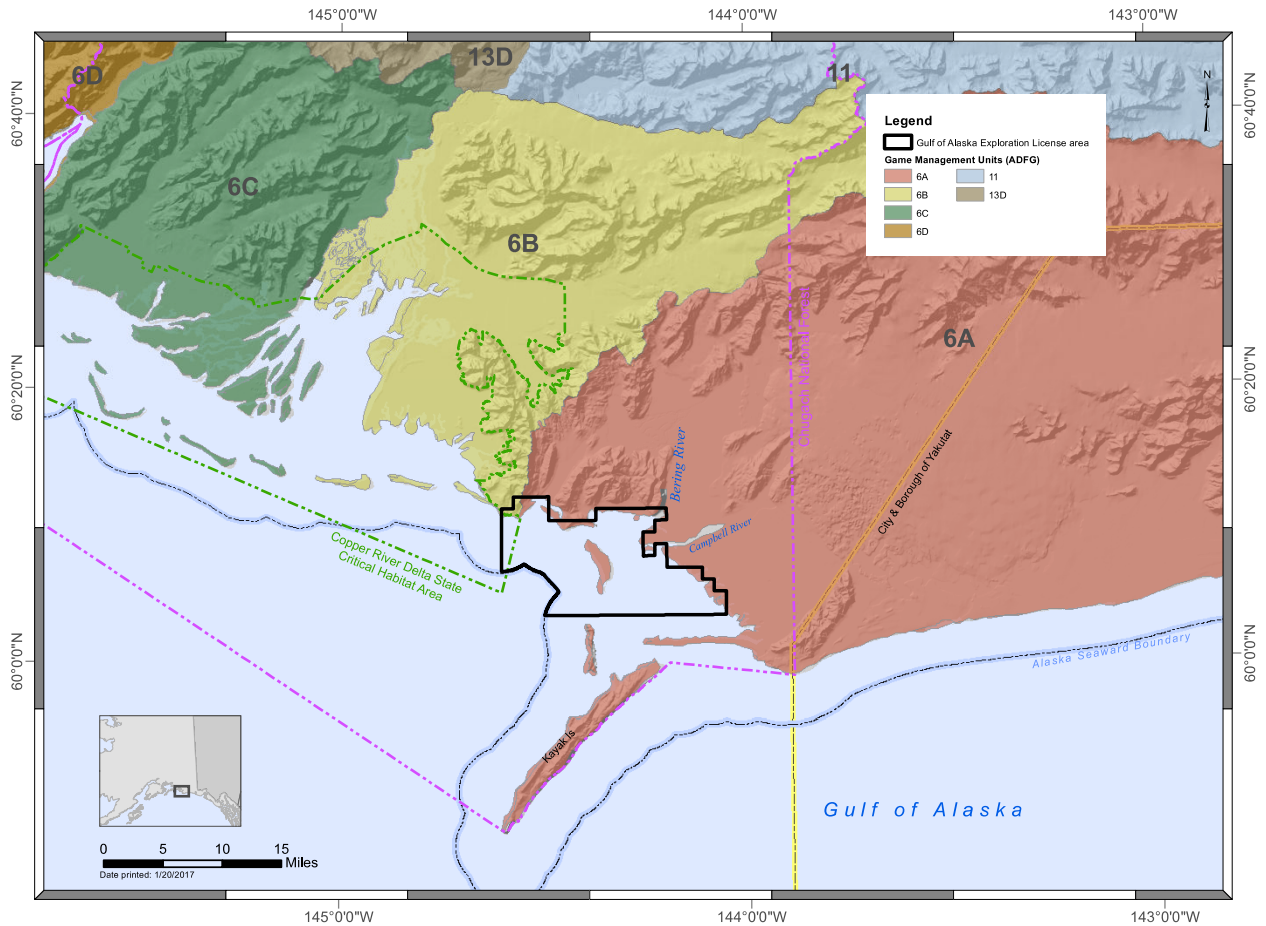
Black bear harvest data and observations indicated that general abundance of black bears increased in the 1990s. Monitoring of the harvests was initiated in 1973. Stakeholders have expressed concern for the population of black bears in the area due to a severe winter in 2011, and late spring of 2012. Harvest of black bear has grown at a rate of approximately 12 percent annually from 1998 to 2007, peaking at 674 bears. However, the harvest rate has declined by 10 percent annually since 2007 with 396 bears taken in 2012. The majority of black bears were harvested by nonresident hunters in GMU 6A during the most recent regulatory periods (Westing 2014a).

Brown bears inhabit most of GMU 6 and are common on the mainland east of Columbia Glacier to Icy Bay. Typically, GMU 6D has the highest number of bears harvested; however, more bears were harvested in GMU 6A during 2012 and 2013. The harvest from GMU 6A may be more stable due to the high percentage of hunts led by a guide. Harvest in the entirety of GMU 6 was considerably lower in 2012 and 2013 with 43 and 48 bears taken respectively, than the 10-year average of 64 bears. Nonresidents took 76 percent of the harvest of brown bears during 2013 (Westing 2015).

Moose were introduced to the western Copper River delta in GMU 6C and the first hunt took place in 1960. The first hunt in GMU 6A took place in 1971. During 2013, 29 moose were harvested from GMU 6A, and 30 moose were harvested in 2014. Both harvests were below the 10-year average of 33 moose. Local residents participated in 79 percent of the successful moose hunts in GMU 6 in 2014 (Westing 2018b).

Hunting for deer in GMU 6 occurs outside of the License Area. Between 1916 and 1923, Sitka black-tailed deer were introduced to GMU 6 when 24 were released on Hawkins and Hinchinbrook Islands. This was the first and one of the most successful big game translocations in the state, in part because of the lack of wolves and coyotes on the islands of the region and the abundant food sources for the deer (Westing 2018a).

In 2011, an extreme weather event occurred causing earlier and more persistent snow which in turn forced the deer to stay nearer the beaches where they were more easily harvested. This resulted in a total estimated harvest for deer of 3,168 deer in 2011, which was a large increase from 2010 with 1,882 deer harvested. This weather event had a ripple effect, with 2012 and 2013 having two of the lowest deer harvests on record, with 630 and 674 deer harvested respectively. More recently, harvest numbers have begun to rise again with 1,495 deer harvested in 2014 and nearly 2,000 harvested in 2015. Cordova residents primarily hunt on Hawkins and Hinchinbrook Islands where there was a 95 percent and 81 percent decline in harvests, respectively. This is thought to be due to the severe winter of 2011 and 2012, and more hunters have not participated in the hunt in the subsequent years. Non-local residents represented up to 60 percent of successful hunters during the 2015 season (Westing 2018a).



**Figure 5.2. Gulf of Alaska Game Management Units**

Mountain goats are hunted in GMU 6, with registration permit hunt RG226 overlapping the western edge of the License Area including Palm Point east to the Katalla River. Small geographic units are used to manage mountain goat hunting to reduce harvest and to distribute hunting pressure. A bag limit of one goat was established in 1976, and the first permit hunt was established in 1980. Conservative harvest strategies allowed the GMU 6 goat population reduced by hunting to 3,000 by 1994 to rebound to approximately 4,000 goats by 1999. Mountain goat hunting season in 6B is generally August 20 to January 31, with most goats harvested in September and October (Westing 2014b). Hunter access to RG266 is by airplane with the 5-year annual means: 6.2 hunters – non-residents 5, residents 0.8; 3.8 goats harvested; and 66 percent hunt success (ADF&G 2020a).

Beaver, river otter, marten, and wolverine are trapped throughout GMU 6. Since 1927, ADF&G has tagged and recorded beaver hides to monitor beaver harvest in GMU 6. Beaver is the most commonly trapped furbearer in GMU 6C and 87 to 96 percent of the harvest comes from this unit. Between 2009 and 2012, beaver harvests ranged from 22 to 25 animals which is below the 10-year average of 65 beavers. About 80 percent of the river otters are trapped in GMU 6D. In 2011, the overall harvest in GMU 6, totaled 22 beavers, 91 river otters, 147 martens, and 17 wolverines were caught (Westing 2013).

Waterfowl hunting is popular in the Controller Bay area and is often conducted concurrently with other hunting and fishing activities. The Copper River delta and Controller Bay areas contain



backwater, sloughs, and marshy areas that provide good jump shooting and opportunities to set up decoys for hunting (Smith 2014). Data specific to the License Area are not available, however data from statewide Alaska waterfowl hunter activity and harvest is compiled by the US Fish and Wildlife Service. In 2017 the top five ducks harvested included: an estimated 21,152 mallards, 6,528 wigeon, 5,831 scoters, 5,223 green-winged teal, and 3,525 northern pintail with a total of 54,200±18 percent harvested by 4,500±10 percent active duck hunters over 18,800±15 percent days afield. In 2018 the top five ducks harvested included an estimated 14,830 mallards, 9,811 wigeon, 5,191 green-winged teal, 4,734 northern pintail, and 3,586 scoters with a total of 45,700±30 percent harvested by 4,200±17 percent active duck hunters over 17,300±22 percent days afield. The 2017 goose harvest included: an estimated 5,069 Canada goose, 3,863 brant, and 724 white-fronted goose with a total of 9,700±46 percent harvested by 1,800±22 percent active goose hunters over 7,600±29 percent days afield. The 2018 goose harvest included: an estimated 5,002 Canada goose, 3,381 brant, and 1,819 white-fronted goose with a total of 10,200±43 percent harvested by 1,900±27 percent active goose hunters over 8,900±32 percent days afield (Raftovich et al. 2019). ADF&G conducted a survey in the summer of 2019 from individuals who purchased a duck stamp in 2018 and summarized data for four water birds of conservation concern: brant, sandhill cranes, common eiders, and king eiders. Of these four waterbirds, only brant were reported as harvested within GMU 6 (ADF&G 2019).

## **5. Other Uses**

### **a. Recreation and Tourism**

The License Area is remote and inaccessible. The region is not connected by roads, and recreational visitors arrive either by airplane, boat, or all-terrain vehicles or snow machines on trails and rivers. Recreational activities include wildlife viewing, camping, rafting, fishing, hunting and trapping. In 2006, Prince William Sound and Resurrection Bay state parks had 81,948 visitor days and an estimated tourist expenditure of \$12.2 million. Landscape viewing was the most popular activity, followed by hiking, wildlife and plant viewing, and photography. Other uses were camping, kayaking, boating, skiing, berry picking, prospecting, and collecting (Elder and Gorman 2008). The presence of wildlife creates wildlife viewing opportunities, both as an independent activity and concurrently with other resource harvest activities. A major tourism industry exists in Prince William Sound based on wildlife viewing.

Since the 1970s, cruise ship visits to Alaska have been increasing. In 2012, Alaska received about 22 percent of all United States cruise ship port visits. In 2018, the Gulf of Alaska had about 20 percent more cruise ship crossings than in previous years. In Alaska, cruise ship visitor volume increased from 470,000 passengers in 1995 to 1.2 million in 2017 (CLIA Alaska 2019). Besides cruise ships, Icy Bay, Disenchantment Bay, and Yakutat Bay are seeing increased recreation tourism with camping, hiking, kayaking, and flightseeing. Due to the continued increase in tourism in the area, Yakutat residents have advocated for a shift to more non-consumptive ecotourism to counteract the ever-increasing competition for subsistence resources like fish and game (Sill et al. 2017).

**b. Forestry**

There are no designated state forests in or around the License Area, however it is surrounded by lands managed by the US Forest Service as part of the Chugach National Forest. According to the Land Management Plan for Chugach National Forest for 2019, there are 11,170 acres available for wood product production in the Chugach National Forest, with the previous 15-year average of 300 cords cut annually (USFS 2019). Timber was harvested commercially on Chugach Alaska Corporation land in east Icy Bay, and on Alaska Mental Health Trust lands between Cape Yakataga and west Icy Bay, approximately 85 miles east of the License Area (City and Borough of Yakutat 2010).

**c. Mining**

There is no active mining in the License Area or in the vicinity, though in the early 1900s copper was mined at Ellamar, in Prince William Sound (Tatitlek Corporation 2014). Additionally, coal was discovered in the Katalla area in 1903 and mined briefly in the early 1900s (Katalla 2018). The Alaska Mental Health Trust Authority has property that could be made available for mining opportunities on its lands 72 miles northwest of Yakutat at Cape Yakataga (AMHTA 2013).

**d. Oil and Gas**

In the early 1900s, oil and gas exploration and development began in the Katalla district, southeast of Cordova. Several periods of delineation and development drilling began in 1904 ending in 1939. During this period, six exploration wells were completed in the Gulf of Alaska basin. Katalla was the location of Alaska's first oil refinery which provided fuel to the Kennecott mine approximately 150 miles to the north of the License Area (Katalla 2018). More details of the history of oil and gas exploration in the region are in Chapter Three and Chapter Six.

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# Chapter Six: Petroleum Potential and the Likely Methods of Oil and Gas Transportation in the License Area

## Contents

	Page
A. Geology .....	6-1
1. Geologic background and regional setting .....	6-1
2. Petroleum Systems and Resource Potential.....	6-2
B. Phases of Oil and Gas Development .....	6-4
1. Disposal Phase .....	6-4
2. Exploration Phase .....	6-5
3. Development and Production Phase .....	6-5
C. Oil and Gas Exploration, Development, and Production Activities.....	6-6
1. Oil and Gas Activities .....	6-6
a. Seismic .....	6-6
b. Drilling.....	6-7
i. Exploration Drilling.....	6-7
ii. Delineation or Development Drilling .....	6-8
iii. Drilling and Production Discharges.....	6-9
c. Roads, Pads, and Facility Construction .....	6-10
D. Likely Methods of Oil and Gas Transportation in the License Area .....	6-10
1. Pipelines.....	6-11
2. Tankers.....	6-11
3. Advantages and Disadvantages of Transportation Methods.....	6-12
a. Pipelines.....	6-12
b. Tankers or Barges .....	6-13
4. Mitigation Measures and Other Regulatory Protections .....	6-13
E. Spill Risk, Prevention, and Response.....	6-14
1. Regulation of Oil Spill Prevention and Response .....	6-14
a. Federal Statutes and Regulations .....	6-14
b. Alaska Statutes and Regulations .....	6-15
c. Industry Contingency Plans .....	6-15
d. Government Contingency Plans.....	6-15
2. Spill History and Risk .....	6-16
a. Drilling.....	6-17
b. Offshore Transportation.....	6-18
c. Pipelines.....	6-18
3. Spill and Leak Prevention .....	6-19
a. Blowout Prevention .....	6-19
b. Leak Detection .....	6-19
4. Oil Spill Response .....	6-20
a. Incident-Command System.....	6-20
b. Response Teams.....	6-21
c. Training.....	6-21
d. Response Organizations.....	6-22
e. Geographic Response Strategies.....	6-23

5. Cleanup and Remediation .....6-23

6. Hazardous Substances .....6-25

F. References .....6-26

# Chapter Six: Petroleum Potential and the Likely Methods of Oil and Gas Transportation in the License Area

## A. Geology

### 1. Geologic background and regional setting

The geologic origins and history of the Yakutat-Gulf of Alaska area are fundamentally different than other southcentral Alaska sedimentary basins. The Yakutat-Gulf of Alaska basin occupies southeast Alaska's marine shelf and onshore coastal plain, where it is exposed in a 30 by 115-mile outcrop belt along the Robinson Mountains. Onshore areas of petroleum potential include the historic oil-producing Katalla district in the west and the Yakataga district to the east, which has been explored, though relatively lightly and without commercial success.

The primary tectonic process in the region is the Oligocene to recent subduction and underplating of the buoyant Yakutat terrane, resulting in significant compressional deformation and uplift. As a region of relatively young and ongoing crustal accretion, the sedimentary strata are entirely Tertiary in age, comprising three stratigraphic sequences. The underlying basement consists of Late Paleocene to Early Eocene basaltic oceanic crust in the area west of the Dangerous River zone, and Cretaceous metamorphic rocks to the east.

The oldest sedimentary units make up the Lower Tertiary sequence, predominantly Eocene in age, consisting of interstratified formations deposited west of the Dangerous River zone, where they reach an overall thickness of up to 1.8 miles (Risley et al. 1992; Trop and Ridgway 2007). This sequence includes two formations. The Kulthieth Formation consists of shallow marine to nonmarine strata with significant sandstone, carbonaceous siltstone, coal, and related coastal plain deposits. The laterally equivalent Stillwater and Tokun Formations are dominated by shale and siltstone deposited mainly in shelfal to deepwater submarine slope environments (Risley et al. 1992; Trop and Ridgway 2007). Some Kulthieth Formation coals have been identified as oil and gas source rocks (Risley et al. 1992; Larson and Martin 1998; Van Kooten et al. 2002), and were interpreted as the source of prolific oil seeps in the Kulthieth Formation at the Samovar Hills near the Malaspina Glacier. Magoon (1994) hypothesized that the Stillwater Formation rather than the Kulthieth was the primary source for the oils in the Lower Tertiary sequence.

The Middle Tertiary sequence is of Oligocene and Miocene age and is dominated by the Poul Creek Formation deposited across a wide area west of the Dangerous River zone; partially equivalent formations further east are more restricted in depositional extent. Consisting of deepwater shale, siltstone, and lesser sandstone, the Poul Creek attains a thickness of approximately 1.2 miles (Risley et al. 1992; Trop and Ridgway 2007). The upper one-third includes organic-rich brown to black shale and mudstone that occur in one or more beds totaling 50 to 790 feet in thickness. Total organic carbon contents range from 1.5 percent to 8 percent, consisting of oil prone marine-algal kerogen (Nelson et al. 1984; Risley et al. 1992). This interval is of significant exploration importance as a potential oil source rock in the region and is the presumed origin of dozens of oil

seeps in the Poul Creek Formation stretching across distances of nine miles in the Katalla District and more than six miles along the Sullivan anticline in the Yakataga District (Martin 1921; Miller 1951b, a, 1957, 1975; Risley et al. 1992; Magoon 1994).

The Upper Tertiary and Quaternary sequence constitutes mainly the Yakataga Formation, glacially influenced elastic deposits of Miocene to Holocene age that locally exceed three miles in thickness (Risley et al. 1992; Hamilton 1994). Represented by interbedded marine, glaciomarine, and glaciofluvial deposits, the Yakataga Formation is dominated by an essentially unsorted rock fabric known as diamictite. This rock type reflects deposition of sediments with a wide range of grain sizes (clay, silt, sand, pebbles, cobbles, and boulders) typically either directly from the melting of sediment-bearing glacial ice, or as debris flows, but in either case, without the size sorting and winnowing that occurs during deposition from moving currents. Other important Yakataga Formation rock types include conglomerate and conglomeratic sandstone, and rhythmites, thinly-bedded, repetitive cycles of alternating slightly coarser versus finer grained sediments, reflecting seasonal shutoff of sediment input during the frozen winter months into lakes, fjords, bays, and similar low-energy environments.

Surficial deposits in the Yakutat-Gulf of Alaska basin are glacial, glaciomarine, and glaciofluvial, essentially the most recent phase of Yakataga Formation deposition. Late Pleistocene to Holocene glacial valleys incised into the underlying Tertiary and Pleistocene strata extend offshore as far as the edge of the continental shelf, and are partially filled by till, outwash, and glaciomarine deposits locally exceeding 160 feet in thickness. The most recent episode of deglaciation began 12,000 to 15,000 years ago, and the current extent of glaciers in the region has been relatively stable for more than 9,000 years (Hamilton 1994).

## **2. Petroleum Systems and Resource Potential**

To accumulate thermally generated hydrocarbons a petroleum system must be present. A conventional petroleum system consists of three major components in conjunction with a critically timed burial history. Those components are:

1. a source rock rich in algal and lipid compounds to generate oil, and cellulose or humic compounds to generate gas; for a source to be effective, it must undergo sufficient burial heating to convert these organic precursors to oil and thermogenic gas, generating fluid pressures that expel them out of the source rock unit; biogenic gas may occur independently of oil or thermogenic gas, formed by bacterial action on organic material in the shallow subsurface;
2. a reservoir rock with porosity to contain the hydrocarbon and permeability to allow it to flow to wells; and
3. a sealed trapping configuration, either structural, stratigraphic, or a combination of both, to promote the accumulation of hydrocarbons in the reservoir after migration from the source, and to prevent their escape.

Unconventional petroleum systems such as shale and tight sand plays are similar but commonly have such miniscule pores and such low permeability that they do not require a mappable trap; the hydrocarbon is trapped by pore-throats that are of similar size to the hydrocarbon molecules.

As noted above, both the Lower Tertiary and Middle Tertiary sequences contain effective oil- and gas-prone source rocks recognized as the source of numerous active petroleum seepages in the Yakutat-Gulf of Alaska basin. Unlike most regions of southern Alaska, the basin offers potential for both conventional and unconventional oil and gas resources.

In the onshore part of the basin, potential conventional reservoir targets include the sandy and conglomeratic portions of most of the Tertiary formations in the Yakutat Terrane. Because the source of Tertiary sediments was onshore to the north and northeast, strata become finer grained with increasing shale content toward the south and southwest. Offshore, adequate porosity, permeability, and thickness to form conventional sandstone reservoirs is likely available only in the Kulthieth and Yakataga Formations (Risley et al. 1992). Unconventional reservoir potential is locally exemplified by the oil seeps and oil wells that formerly produced from folded and fractured black shales in a fault zone mapped by (Miller 1975) in Oligocene strata equivalent to the Poul Creek Formation at the Katalla oil field.

Because the Gulf of Alaska region has experienced faulting and folding associated with compressional and strike-slip tectonics throughout the Tertiary, numerous structures were formed prior to the timing of petroleum generation and migration, and thus have the potential to form effective traps for conventional hydrocarbon accumulations. Stratigraphic traps are also likely to be present, given the lateral variations in depositional thickness, reservoir, and seal facies, and erosional truncations that are commonplace in structurally complex areas. For conventional plays, exploration challenges include locating undrilled traps of sufficient size to justify economic development; as noted by (Miller 1975), anticlines in the Katalla area are “either inaccessible or too small and complex to justify exploratory drilling to date.”

The Bering River coal field just northeast of Katalla hosts 110 million short tons of identified mineable coal resources in the Oligocene Kushtaka and Kulthieth Formations. Varying from bituminous to anthracite rank, seams locally reach thicknesses of up to 30 feet where thickened by strong deformation (Merritt and Hawley 1986). The intensive folding and faulting that have contributed to the elevated rank of this coal field have also proven detrimental to attempts to mine these resources, and the same factors make the Bering River coal unfavorable to exploitation of coalbed gas resources. Some 50 miles east of the Bering River coal field, the Duktoth River coal district is a smaller occurrence of bituminous coals. Data are insufficient to quantify the mineable coal resources or coalbed gas potential in the Duktoth River area, but it is likely significantly less than the Bering River coal field, due to similar structural complexity and much reduced area.

The onshore Katalla area alone hosts at least 75 oil seeps, 11 gas seeps, and dozens of historical wells that produced approximately 154,000 barrels of oil along with significant but undocumented quantities of natural gas between 1902 and 1933 (Miller 1951a). All available information indicates this is an unconventional shale oil play, as the oil produced there flowed from fault and fracture systems in structurally complex, very low porosity and permeability shales and mudstones rather than from conventional reservoir rocks. It is likely that the unconventional shale play still holds technically recoverable oil and gas resources. Current drilling and completion technologies would likely yield better flow rates and ultimate recovery than were achievable in the early 1900s. Considerable new exploration drilling and testing using these unconventional methods could incur significant costs. However, this may be necessary to determine whether production rates and ultimately recoverable volumes would be sufficient to overcome the area’s geologic and logistic

complexities, making development commercially viable. For conventional plays, the exploration challenge is to locate undrilled traps of sufficient size to justify economic development.

## **B. Phases of Oil and Gas Development**

There are several different phases of oil and gas activities: disposal or licensing and leasing, exploration, development, and production. While not all post-disposal oil and gas activities are routine, there are some oil and gas activities that are reasonably foreseeable because they are commonly undertaken regardless of the project. Routine oil and gas activities include seismic surveys, drilling, construction of facilities, and pipelines and production.

Oil and gas activities include those direct and indirect activities that have occurred in the past, are presently occurring, or are likely to occur in the future. Petroleum-related activities include such major undertakings as conducting seismic operations, constructing roads and trails for transporting equipment and supplies, drilling exploration and delineation wells, constructing gravel pads and roads, drilling production and service wells, installing pipelines, and constructing oil and gas processing facilities. The activities likely to have the greatest effects vary by resource.

Common industrial facilities potentially associated with the oil and gas industry in the License Area include: drill sites, well pads, production pads and injection pads, platforms, wells (such as exploratory, development, production and waste disposal), processing facilities, facility oil piping, crude oil and natural gas transmission pipelines, flow lines and pipelines, maintenance complex, emergency response center, gravel roads, airports, bridges, docks, power plants, refineries, and camp facilities.

### **1. Disposal Phase**

An exploration license serves as the disposal of state lands, and as the license can be converted to leases, is the first required step in developing the state's oil and gas resources. The exploration license program supplements the state's oil and gas leasing program by targeting areas outside of known oil and gas provinces. The intent of exploration licensing is to encourage exploration in areas far from existing oil and gas infrastructure, with unknown hydrocarbon potential, and where there is a higher investment risk to the operator. Through exploration licensing, the state receives the license fee and valuable subsurface geologic information on these undeveloped regions and, if the license is converted to leases and development occurs, additional revenue through royalties and taxes could be realized.

Exploration licensing allows interested parties to explore frontier basins without the initial expense of bonus bids or the other costs and restrictions of a competitive oil and gas lease sale. An exploration license gives the licensee the exclusive right to use the licensed area for exploration activities. If the license is converted to leases, the licensee (now lessee) will have the right to use the leased area for development and production activities. However, neither a license or a lease authorizes operations or any specific activities to be conducted on the area.

## **2. Exploration Phase**

The purpose of the exploration phase is to search for reservoirs of oil and gas. Oil and gas resource exploration begins with gathering information about the petroleum potential of an area by examining the surface and subsurface geology, researching data from existing wells, performing environmental assessments, conducting geophysical surveys, and drilling exploratory wells. The surface analysis includes the study of surface topography or the natural surface features, and near-surface structures revealed by examining and mapping nearby exposed rock layers. Geophysical surveys, primarily seismic, help reveal the characteristics of the subsurface geology, and normally precede exploratory drilling. Although geophysical exploration and exploration drilling are activities that could result in potential effects within the License Area, exploration would be limited to between November 1 and March 31 which would minimize effects on wildlife as described in Chapter Nine.

Common activities undertaken during the exploration phase include aerial and geophysical surveys used to define prospects, geological studies, core testing, and exploratory drilling. Exploration wells may be used to drill in unproven areas, for field extension step outs, or delineation wells used in unproven areas to increased proven limits of a field, or to conduct deep tests within a producing area to unproven deeper zones.

## **3. Development and Production Phase**

The development and production phases are interrelated and overlap in time; therefore, this section discusses them together. During development, operators evaluate the results of exploratory activities and develop plans to bring the discovery into production. Production operations bring well fluids to the surface and prepare them for transport to the processing plant or refinery. These phases can begin only after some exploration has been completed and tests show that a discovery is economically viable. However, exploration in new formations for additional reserves can continue in concert with development and production activities.

The purpose of development is to gather, examine, and analyze geologic and other data pertaining to newly discovered reservoirs drilled in exploration to plan how to produce the maximize recovery of hydrocarbons from a reservoir. Common activities include drilling development and disposal wells, construction of roads and pads, and installation of pipelines and production facilities. Development wells are drilled in proven areas of a field to prepare for production operations. Some production operations overlap with development operations. Delineation and development drilling occur after initial discovery of hydrocarbons in a reservoir and several wells may be required.

Production is the process of bringing well fluids to the surface and preparing them for transport to the processing plant or refinery. The fluids undergo operations to be purified, measured, tested, and transported. Pumping, storage, handling, and processing are typical production processes. The final project parameters will depend on the surface location, size, depth, and geology of a specific commercial discovery. Production also refers to the amount of oil or gas produced in a given period. Pipeline systems are built, and then transportation of oil and natural gas begins.



## **C. Oil and Gas Exploration, Development, and Production Activities**

### **1. Oil and Gas Activities**

#### **a. Seismic**

Seismic survey work is an integral part of exploration for oil and gas fields. Seismic data is collected from surface-induced seismic pulses to image subsurface formations with sensors collecting the data as seismic shock waves bounce off formations. The shock waves are generally created by vibrator trucks along predetermined lines or deploying these techniques behind a marine vessel. Seismic surveys are typically conducted in two-dimension (2D) or three-dimension (3D) surveys. Both survey types are useful for evaluating a prospect.

Seismic survey work may be used during all phases of oil and gas development, including before disposal, to locate and produce oil and gas from new and existing developments. Companies may elect to license existing data and reprocess the data without conducting a seismic survey. Other companies may acquire data through commissioning their own program. It is also common for seismic contractors to conduct seismic surveys on behalf of, or with the potential to market to, a licensee. Geophysical exploration by means of seismic surveys informs the analysis of a play, where a company will conduct exploratory drilling, further mapping of a producing field, and evaluating new intervals throughout the development process.

To conduct a seismic survey, source and receiver locations are surveyed using Global Positioning Systems and traditional land survey methods. Source and receiver locations are laid out in predesigned patterns. For 2D data, the receivers and sources lie in as straight a line as possible given the terrain and can extend for many tens of miles. For 3D data, data is collected over a much wider swath, and can cover tens to hundreds of square miles. 2D seismic programs usually have fewer crewmembers and employ much less equipment than 3D programs. A 3D seismic survey is similar to 2D acquisition with more sensors collecting more data (Rigzone 2018a).

Multiple seismic sources can be used on land surveys, based on the terrain and conditions, including explosives, weight drop, and hydraulic devices (vibrator trucks). Explosives may be placed into drill holes and detonated, or, much less commonly, they may be suspended on stakes above the ground (Poulter method). When buried, drill holes are typically 20 to 35 feet deep with 2.5 to 5 pounds of explosives set at the bottom of the hole. Holes are either drilled with track-mounted drills or, if in remote or sensitive areas, drills are slung into position by helicopters. Soil is disturbed in the immediate vicinity of the explosive charges placed into the ground. At locations with existing developments, allowable maximum peak particle velocity is mapped and if explosives are contra-indicated, vibrators or a weight drop are used to produce the seismic wave energy (Shellenbaum 2013).

In intertidal (transition) zones, either shallow hole explosive sources at low tide or very shallow towed airguns at high tide can be used. The receivers are typically connected by cables laid directly on the mud. Seismic surveys may also be conducted in marine waters. Marine seismic programs typically use a vessel between 100 and 175 feet long. Marine seismic equipment consists of an

airgun array for the energy source, hydrophones to detect sound, an amplifier and recording system, and a navigation system. For some seismic surveys, the detectors and cables are placed directly on the bottom (ocean bottom cable, or OBC) where they remain stationary as the shooting boat traverses across them.

Recently, “nodal” acquisition technology has been used. “Nodal” acquisition uses receivers placed in battery-powered nodes that store data internally or transmit data to recording instruments. Nodal receivers are preferred in rough terrain, urban areas and applications near roads, and river crossings (Shellenbaum 2013). Additional seismic techniques can be used to gather information specifically about the ocean bottom and very near surface geology, usually to identify drilling hazards.

In addition to seismic data, gravity and magnetic data surveys are collected. In these surveys, airborne instruments measure the intensity of the earth’s gravity or magnetic field. Resulting measurements are processed and interpreted to yield information about the subsurface mineralogy and structure. Since the field measurements are passive, as opposed to the use of an active seismic source, these surveys are often referred to as “potential field data.” There is little to no impacts to the environment from this type of passive survey methodology.

When a contractor seeks a permit to perform a seismic survey of any variety on uplands or submerged state lands in the License Area, a miscellaneous land use permit (MLUP) is required through DNR. Seismic surveys can be performed at any phase of oil and gas development and whether a party holds interest in the subject license or not. Through the MLUP review, DNR will evaluate the project plan and consider other agencies’ input and authorities to assess potential impacts of the project. Potential project impacts are mitigated through mitigation measures or stipulations.

## **b. Drilling**

Before initiating any drilling, a plan of operation application must be submitted to DNR for review. The application is reviewed for legal compliance by DNR and other state, federal, and local government entities. DNR evaluates foreseeable effects of the proposed application operations, assesses compliance with mitigation measures, and determines the need for stipulations to protect resources and the best interest of the state. An application may require conditions for approval before final approval of a plan of operations. All well drilling is subject to plan of operation approval. Other agencies also issue authorizations for drilling of wells.

### ***i. Exploration Drilling***

Exploratory drilling often occurs after seismic surveys are conducted, and when the interpretation of the seismic data incorporated with all available geologic data reveals oil and gas prospects. Exploration drilling, which proceeds only after obtaining the appropriate permits, is the only way to determine whether a prospect contains commercial quantities of oil or gas. Drilling operations collect well logs, core samples, cuttings, and a variety of other data. A well log is a record of one or more physical measurements as a function of depth in a borehole and is achieved by lowering measuring instruments into the well bore. Well logs can also be recorded while drilling. Cores may be cut at various intervals so that geologists and engineers can examine the sequences of rock that are being drilled (Chaudhuri 2011).

Drilling technology continues to improve to minimize environmental footprint and maximize oil or gas recovery. Multilateral, horizontal, and extended reach wells can access a greater reservoir extent than a conventional straight-hole well while improving pressure maintenance and enhanced recovery methods (Joshi 2008). Drilling in the License Area would be restricted to onshore locations as described in Chapter Nine. Very generally, the drilling process begins with special steel pipe (conductor casing) bored into the soil. Then, a drill bit, connected to the end of the drill pipe, rotates and drills a hole through the rock formations below the surface. Upon reaching a targeted depth, the hole is cleaned up and surface casing, a smaller diameter steel pipe, is lowered into the hole and cemented in place to keep the hole from caving in, seal off rock formations, seal the well bore from groundwater, and provide a conduit from the bottom of the hole to the drilling rig. After surface casing is set, drilling continues until the objective formation is reached. Once the drilling is complete, the well is tested, and decisions are made on well completion techniques or plugging and abandoning the well (Rigzone 2018b).

### ***ii. Delineation or Development Drilling***

After designing the facilities and obtaining the necessary permits, the operator constructs permanent structures and drills production wells. The operator must build production structures that will last the life of the field and may have to design and add new facilities for enhanced recovery operations as production proceeds. The development “footprint” has decreased in recent years as advances in drilling technology have led to smaller, more consolidated pad sizes.

Directional drilling is used to extend the length of the reservoir that is penetrated by the well (US Senate 2011). The drilling technique used is controlled to direct the bore hole to reach a particular part of the reservoir. Directional drilling technology enables the driller to steer the drill stem and bit to a desired bottom-hole location, sometimes miles away from the surface location of the rig. Directional wells initially are drilled straight down to a predetermined depth and then gradually curved at one or more different points to penetrate one or more given target reservoirs (Duplantis 2016).

Directional drilling allows multiple production and injection wells to be drilled from a single surface location such as a gravel pad or offshore production platform, thus minimizing cost and the surface impact of oil and gas drilling, production, and transportation facilities. A single production pad and several directionally drilled wells can develop more than one and possibly several 640-acre sections. It can also be used to reach a target located beneath an environmentally-sensitive area and may offer the most economical way to develop offshore oil fields from onshore facilities. Extended reach drilling is used to access reservoirs that are remote, up to six miles, from the drilling location. These techniques allow for drilling into reservoirs where it is not possible to place the drilling rig over the reservoir (US Senate 2011).

In addition to production wells, other wells are drilled to inject water or gas into the field to maximize oil recovery. These wells generally are referred to as service, or injection, wells. Numerous injection wells are required for waterflood programs, which are used routinely throughout the production cycle to maintain reservoir pressure. Application of horizontal well technology can reduce the number of production wells required to drain a pool and reduce the number of drilling pads and their sizes (US Senate 2011).

The AOGCC, through its statutory and regulatory mandate, oversees drilling and production practices for safety measures, to maximize oil and gas recovery, prevent waste, and ensure protection of correlative rights within the state. It is a quasi-judicial agency that conducts hearings to review drilling and development to ensure regulatory compliance.

### ***iii. Drilling and Production Discharges***

The bulk of the waste materials produced by oil and gas activities, onshore and offshore, are produced water and drilling muds and cuttings. Small quantities of treated waste, produced sand, chemical products, excess cement, and trash and debris can also be produced (Joshi 2008). The fluids pumped down the well are called “mud” and are naturally occurring clays with small amounts of biologically inert products. Different formulations of mud are used to meet the various conditions encountered in the well. The mud cools and lubricates the drill bit, prevents the drill pipe from sticking to the sides of the hole, seals off cracks in down-hole formations to prevent the flow of drilling fluids into those formations, and carries cuttings to the surface (Joshi 2008).

Disposal of mud, cuttings, and other effluent is regulated by the National Pollutant Discharge Elimination System (NPDES) and the US Environmental Protection Agency’s (EPA) Underground Injection Control program administered by the AOGCC under regulations in 20 AAC Chapter 25. The state discourages the use of reserve pits, and most operators store drilling solids and fluids in tanks or in temporary on-pad storage areas until they can be disposed of, generally down the annulus of the well or in a disposal well that is completed and equipped to take mud and cuttings; and permitted in accordance with 20 AAC 25.080 and 20 AAC 25.252. If a reserve pit is necessary, it is constructed off the drill pad and could be as large as 5 feet deep and 40 feet wide by 60 feet long. It is lined with a 0.3 inch (8.0 millimeter) thick geotextile liner to prevent contamination of surrounding soils. Drilling muds, fluids, and cuttings produced from the well are separated and disposed of, often by reinjection into an approved disposal well annulus or disposal well, or they may be shipped to a disposal facility out-of-state.

In the case of offshore platforms, the waste is treated and released or transported onshore for appropriate disposal. Section 402(a) of the Clean Water Act prohibits the discharge of produced water and drilling wastes into the marine environment from oil and gas production facilities that are either onshore or in coastal waters.

Produced water is water that comes from an oil and gas reservoir to the surface through a production well with hydrocarbons. It is the largest waste stream of conventional oil and gas wells. The produced water volume increases over the economic lifetime of a producing field and may be up to 95 percent of the total volume produced by the end of the field’s production history. Produced water contains formation water, injection water, and other chemical additives such as hydrate inhibitors, emulsion breakers, flocculants, coagulants, defoaming agents, scale and corrosion inhibitors, bactericides and other substances (AMAP 2010). Often, seawater is treated and injected into the reservoir in addition to produced water to maintain pressure, improve recovery, and replace produced fluids. When produced water can no longer be treated and reinjected, the alternative is disposal. The Alaska Department of Environmental Conservation (ADEC) and AOGCC authorize disposal of produced water. More information can be found in Chapter Seven outlining government authorities to regulate wastewater disposal and produced water injection.

### **c. Roads, Pads, and Facility Construction**

After a discovery of oil or gas is sanctioned for development upon positive results from delineation wells and seismic surveys, several construction activities are required to develop a permanent production operation. A production operation complex would, at a minimum, contain a production pad that could potentially support from one well to dozens of wells and contain a central processing facility for an oil field or a combined central processing and gas compressor facility. In addition, a production complex may typically include an airstrip, roads, camp facilities, and storage yard. The production operation also may include feeder lines, regional pipelines, a booster pump for oil or additional compression stations for gas, a gas conditioning facility, and a gas or oil sale pipeline to transport the resource to market (NRC 2003). Similar to drilling operations, all construction activities on a license or lease are subject to a plan of operations approval by the DNR. The construction or maintenance of major production facilities also requires plans of exploration or development.

Drilling in the License Area would be restricted to onshore locations as described in Chapter Nine. When drilling onshore, the drill site is selected to provide access to the prospect and, if possible, is located to minimize the surface area that may have to be cleared. Sometimes temporary roads must be built to the area. Roads are constructed of sand and gravel placed on a liner above undisturbed ground. Construction of support facilities such as production pads, roads, and pipelines may be required. A typical drill pad is made of sand and gravel placed over a liner and is about 300 feet by 400 feet. The pad supports the drill rig, which is brought in and assembled at the site, and, if necessary, a fuel storage area and a camp for workers. If possible, an operator will use nearby existing facilities for housing its crew. If the facilities are not available, a temporary camp of trailers on skids may be placed on the pad.

Production facilities generally include several production wells, water injectors, gas injection wells, and a waste disposal well. Wellhead spacing may be as little as 10 feet. A separation facility removes water and gas from the produced crude, and pipelines carry the crude to the onshore storage and terminal facilities. The oil is then piped to a refinery or loaded onto tankers for shipment to outside refineries. Some of the natural gas produced is used to power equipment on the platform, well pad, or processing facility but most is re-injected to maintain reservoir pressure in those reservoirs that have a surplus of produced gas. Oil and gas production operations generally follow similar paths to market. Once produced from downhole, oil and gas move through production facilities for separation and processing, the sales product then moves through a metering station, and on to market.

At the time of writing the finding, it is nearly impossible to predict what a full development scenario will entail. The final project parameters will depend on the surface location, size, depth, and geology of a specific commercial discovery.

## **D. Likely Methods of Oil and Gas Transportation in the License Area**

AS 38.05.035(g)(1)(B)(viii) directs that best interest findings shall consider and discuss the method or methods most likely to be used to transport oil or gas from the License Area and the advantages,

disadvantages, and relative risks of each. A discussion of specific transportation alternatives for oil from the License Area is not possible at this time because strategies used to transport potential petroleum resources depend on many factors, most of which are unique to an individual discovery. The location and nature of oil or gas deposits determine the type and extent of facilities necessary to develop and transport the resource. DNR and other state, federal, and local agencies will review any specific transportation system when it is proposed. Modern oil and gas transportation systems usually include the following major components: pipelines, and tankers from marine terminals. Oil and gas produced in the License Area would most likely be transported by a combination of these depending on the type, size, and location of the discovery.

The method of transporting oil or gas from a discovery is an important factor in determining whether discoveries can deliver commercial quantities of oil or gas. The more expensive the transportation option, the larger the discovery needed for economic viability. Because there are no roads to or near the License Area, the only likely transportation methods would be an export pipeline connecting to the Trans Alaska Pipeline System or a marine terminal in the License Area with transport by barges and/or tankers.

## **1. Pipelines**

The most common method of transporting oil in the Alaska is by pipeline. Pipelines may be onshore or offshore. A pipeline or pipeline facility means all the facilities of a total system of pipe, whether owned or operated under a contract, agreement, license or lease, used by a carrier for transportation of crude oil, natural gas, or products for delivery, for storage, or for further transportation. A pipeline is a general term that includes all the components of a total system of pipe to transport crude oil or natural gas or hydrocarbon products for delivery, storage, or further transportation (AS 38.35.230).

Offshore platforms and subsea pipelines are technologically feasible but are prohibited in the License Area as described in Chapter Nine.

An export pipeline to the Trans-Alaska Pipeline System (TAPS) or to a deep-water port location outside of the License Area would require about 100 miles of pipeline and would likely need to parallel and/or cross the Copper River/Copper River delta, mountainous areas underlain by isolated masses of permafrost, and potentially several moving ice/frozen land masses. The region is also an active seismic area adding to the technical complexity.

## **2. Tankers**

Barges and tankers can transport petroleum all around the world. Because these marine vessels can carry large quantities of fuel, the cost per barrel to move oil by marine vessels can be cost-effective. In general, large capacity tankers are more cost-effective than small capacity tankers and barges for transporting oil. Barges are smaller and may be either self-propelled or are moved with ocean-going tugs. Barges can be either pushed or towed by tugs. This makes barges very ineffective for transporting oil long distances or for traveling across rough seas. Barges are most often used for transporting fuel shorter distances in calmer coastal waters (Frittelli 2014).

The only state land available in the License Area for a marine terminal and tank farm to support transportation by barge or tanker would be at Katalla Bay. The bay is somewhat sheltered from offshore winds but is exposed to winds from the southeast to the southwest. A boulder reef extends out from Palm Point with shallow water depths and boulder reefs that extend up to 0.4 miles south of Pam Point (NOS 2019). Water depths near the shoreline in Katalla Bay appear to range from 7.5 feet to 21 feet (NOS 2019), and would likely require dredging and blasting to accommodate even the smallest class of tankers with vessel drafts of 20 to 58 feet. In addition, seasonal restrictions may limit loading and shipping activities to 5-months of the year during November 1 to March 31 as described in Chapter Nine (AOOS 2020).

### **3. Advantages and Disadvantages of Transportation Methods**

Transporting and distributing petroleum products and natural gas from oilfields to refining and processing plants requires a comprehensive transportation system. Any oil or gas ultimately produced from leases converted from the License Area will have to be transported to market. The director is required under AS 38.05.035(g)(1)(B)(viii) to consider and discuss the method or methods most likely to be used to transport oil or gas from the License Area, and the advantages, disadvantages, and relative risks of each. The disadvantages and advantages of each transportation method are described with discussions of the relative risks of each transportation method addressed under the Spill History and Risk section below.

#### **a. Pipelines**

Safety and reduced environmental effects are important advantages of pipeline transportation for oil and gas resources. Data from several United States and Canadian studies strongly suggest that pipelines are the safer way to move oil compared to railways or roadways (Green and Jackson 2015). From 1992 to 2011, Pipeline and Hazardous Materials Safety Administration (PHMSA) data shows far fewer incidents from gathering lines than transmission and distribution lines. The data further reflects the incidents of rail and trucking far exceed the incident rates of natural gas pipelines (Furchtgott-Roth 2013).

Additional advantages of transporting natural gas through pipelines are the reduced operational cost; and a faster, more dependable delivery to markets. Elevated pipelines onshore are relatively easy to maintain and visually inspect for leaks, but they can restrict wildlife movements unless provisions are made to allow for their unimpeded passage. Buried pipelines are more common on shore, but leaks can be more difficult to detect.

The most distinct disadvantage of pipelines is their high up-front investment for construction costs. However, once the cost is borne, the cost to move petroleum products is significantly less expensive than other transportation methods. Pipeline transportation in the United States has approximately 280 significant spills each year where there is either a fatality, injury requiring hospitalization, or the spill causes over \$50,000 in damages. Although pipeline spills do occur, they are rare in relation to the massive quantity of product they move per year. Transportation by pipeline is 4.5 times less likely to result in a spill than transport by rail when the amount transported is considered (Strata 2017).

Technical design of pipelines and other facilities reduces the chance of oil spills. National industry standards, and federal, state, and local codes and standards ensure the safe design, construction, operation, maintenance, and repair of pipelines and other facilities. The potential problems and risks associated with transportation of natural gas through pipelines are typically addressed in mitigation measures and lease stipulations. A major risk of transporting gas through a pipeline is a leak or explosion. The measures and methods employed to prevent leaks or explosion, including line integrity protection, pipeline monitoring, and in-line inspections, are detailed in the Spill and Leak Prevention section below.

Challenges to constructing pipelines include soil conditions such as permafrost, deep sea locations, and waterbody crossings. A wide range of construction techniques exist to address these challenges, such as Horizontal Directional Drilling under waterbodies and use of thicker pipe in permafrost or areas of high pressure, such as subsea depths. Pipelines can be constructed year-round, as appropriate to conditions in a given location. For example, winter may be a preferable construction season for crossing wetlands or waterbodies, to minimize environmental impacts. Specific pipeline design and construction challenges would be determined on a case-by-case basis, and appropriate mitigation measures would be required to ensure safe design, construction, and operation to protect the environment and property interests.

#### **b. Tankers or Barges**

Oil tankers and barges move large amounts of oil to a variety of locations throughout the world and are very cost-effective. Over 13 billion barrels of oil were transported by marine vessel in 2016 (CRS 2018). The United States Coast Guard (USCG) maintains a vessel traffic system in Prince William Sound in combination with industry-supplied escort tugs for tanker traffic.

Use of oil tankers brings the risk of potentially large spills into marine waters. The occurrence of large (greater than 4,800 barrels), medium (48 to 4,800 barrels), and small (less than 48 barrels) spills has decreased significantly over the past 50 years. Most spills from tanker operations are small and occur during loading or unloading. Most medium to large spills occur while vessels are underway and result from allisions, collisions, and groundings. The volume of oil lost in accidents during 2010 to 2017 represented 1 percent of the volume delivered safely (ITOPF 2018).

Seasonal restrictions may limit loading and shipping activities to 5-months of the year during November 1 to March 31 when high winds and waves are common in the eastern Gulf of Alaska (AOOS 2020). High winds and waves may create unsafe conditions for berthing and loading at a marine terminal in the License Area. In contrast, the Valdez Marine Terminal is located within Prince William Sound where waters are more protected from exposure to the open ocean. Loading or discharging activities accounted for 9 percent of large spills and 29 percent of small spills from 1970 to 2019 and 11 and 21 percent from 2010 to 2019 (ITOPF 2020).

### **4. Mitigation Measures and Other Regulatory Protections**

The decision to license or lease oil and gas resources in the state does not authorize the transportation of any product. If oil or gas is found in commercial quantities and production is proposed, final decisions on transportation will be made through the local, state, and federal permitting processes. Those processes will consider any required changes in oil spill contingency



planning and other environmental safeguards and will involve public participation. The state has broad authority to withhold, restrict, and condition its approval of transportation facilities. In addition, boroughs, municipalities, and the federal government have jurisdiction over various aspects of any transportation alternative. Measures are included in this best interest finding to avoid, minimize, and mitigate potential negative effects of transporting oil and gas (see Chapter Nine). Additional site-specific and project-specific mitigation measures may be imposed as necessary if exploration and development take place.

## **E. Spill Risk, Prevention, and Response**

AS 38.05.035(g)(1)(B)(vii) requires the director to consider and discuss mitigation measures to prevent and mitigate releases of oil and hazardous substances and a discussion of the protections offered by these measures.

Oil spills and natural gas releases could occur on pads within the License Area during exploration activities, development and production drilling, and in transportation.

Chapter Seven provides information on regulatory authorities for prevention and response, process for spill or release containment, cleanup, and response training. Chapter Nine includes mitigation measures related to the release of oil and hazardous substances developed after the director considered the risk of oil spills, methods for preventing spills, and techniques for responding to spills.

### **1. Regulation of Oil Spill Prevention and Response**

#### **a. Federal Statutes and Regulations**

The Federal Water Pollution Control Act of 1948 (33 U.S.C. 1251 et Seq.) was the first major US law to address water pollution. In 1972, it was amended and became known as the Clean Water Act (CWA). The amendments provided the Environmental Protection Agency (EPA) with the authority to set effluent and water quality standards for all contaminants in surface waters and developed a basic structure for regulating discharges of pollutants into waters of the United States. In 1973, under the authority of Section 311 of the CWA, oil pollution prevention requirements were established for prevention of, preparedness for, and response to oil discharges at specific non-transportation related facilities. To prevent oil from reaching navigable water and adjoining shorelines, regulations required these facilities to develop and implement Spill Prevention, Control, and Countermeasure (SPCC) Plans and established procedures, methods, and equipment requirements (Subparts A, B and C).

The Oil Pollution Act of 1990 (OPA 90) was enacted into law after the Exxon Valdez oil spill to strengthen the national response system. It amended the CWA and provided new requirements for contingency planning by government and industry under the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). OPA 90 increased penalties for regulatory noncompliance, broadened the response and enforcement authorities of the federal government, and preserved state authority to establish laws governing oil spill prevention and response. On July 1,

1994, EPA finalized the revisions that direct facility owners or operators to prepare and submit plans for responding to a worst-case discharge of oil (Subpart D).

The enactment of OPA 90 also established and funded the Oil Spill Liability Trust Fund (OSLTF), increased limits of liability for responsible parties, and included natural resource damages as a component of liability.

### **b. Alaska Statutes and Regulations**

ADEC's Division of Spill Prevention and Response, Prevention Preparedness and Response (PPR) Program implements oil pollution prevention and response regulations for oil and gas industry operations in Alaska under the authority of AS 46.04.030. Statutes establish the requirement for prevention and response planning, compliance, and financial responsibility for regulated operators. Before operating in Alaska, all regulated operators, including exploration and production facilities are required to provide proof of financial responsibility that is approved by ADEC.

Oil and other hazardous substance pollution control regulations are found in Alaska Administrative Code, Title 18, Chapter 75 (18 AAC 75). Regulations specify prevention technology for each regulated operation and establish oil discharge prevention and contingency planning standards, timelines, and review and approval processes. ADEC regulations also establish pollution notification, response, and cleanup standards for all potential spillers, whether they are a regulated operation or not.

Alaska Department of Fish and Game (ADF&G) and DNR support ADEC by providing expertise and information. The industry must file an oil discharge prevention and contingency plans with ADEC before operations commence. DNR reviews and provides comments to ADEC regarding the adequacy of industry contingency plans.

### **c. Industry Contingency Plans**

All oil and non-exempt gas exploration facilities are required to have an ADEC-approved Oil Discharge Prevention and Contingency Plan (ODPCP or contingency plan) prior to the start of operations. ADEC regulations establish response planning standards (RPS) for each operation that determines the amount of oil that a facility must demonstrate they are capable of controlling, containing, and cleaning up. The RPS for exploration facilities starts at 16,500 barrels, and it may be increased or decreased based on well data, exploration data, and other technical documentation provided to AOGCC and ADEC. Contingency plans for exploration facilities must include: a description of methods for responding to and controlling blowouts; the location and identification of oil spill cleanup equipment; the location and availability of suitable drilling equipment; and an operations plan to mobilize and drill a relief well. If development and production should occur, additional contingency plans must be filed for each facility before beginning an activity as part of the permitting process. Any vessels transporting crude oil from the potential development area must also have an approved contingency plan.

### **d. Government Contingency Plans**

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) is the federal government's blueprint for responding to both oil spills and hazardous substance releases. It

establishes a response headquarters, the National Response Team (NRT), and Regional Response Teams (RRT). The 1972 amendment to the CWA required the CWA to include a framework for responding to oil spills and hazardous substance releases.

In accordance with AS 46.04.200 and AS 46.04.210, ADEC prepares Statewide Master and Regional Oil and Hazardous Substance Discharge Prevention and Contingency plans. Alaska has joined the USCG and EPA to align planning efforts to meet both federal and state requirements. The Statewide Master planning requirements are fulfilled in the joint federal/state Regional Contingency Plan (RCP) promulgated in August 2018 as part of a significant effort to align government planning in Alaska with the NCP and National Response Framework. The RCP is administered by the Alaska Regional Response Team (ARRT) and serves as guidance to government and industry planners preparing for a coordinated federal, state, and local response to a discharge or a substantial threat of a discharge of oil or other hazardous substances from a facility or vessel operating within Alaska and surrounding waters. It establishes regional planning policy and is the foundation for development of the four Area Contingency Plans in Alaska.

There are four Area Contingency Plans (ACPs) in Alaska: Arctic & Western Alaska ACP; Prince William Sound ACP; Southeast Alaska ACP; and the Inland Alaska ACP. The three coastal ACPs align with USCG Captain of the Port Zones and extend seaward 200 nautical miles. They also extend inland 1,000 yards. The Inland Alaska ACP covers response planning for all of Alaska from the 1,000-yard inland range of the coastal ACPs.

## **2. Spill History and Risk**

Any time crude oil or petroleum products are handled there is a risk that a spill could occur. Oil spills associated with the exploration, development, production, storage, and transportation of crude oil may occur from well blowouts, pipelines leaks, transportation accidents (tanker, barge, or truck) or storage tank leaks. Petroleum activities may generate chronic low-volume crude oil or refined fuel spills associated with normal operation of drilling rigs, vehicles, vessels, and other facilities for gathering, processing, loading, transporting, and storing of crude oil. Spills may also be associated with the transportation of refined products to provide fuel for generators, marine vessels, and other vehicles used in exploration and development activities. Generally, the highest frequency of spills come from facility oil piping, process piping, and tanks. A worst-case oil discharge from an exploration facility, production facility, pipeline, or storage facility is restricted by the maximum tank or vessel storage capacity, or by a well's ability to produce oil.

Since 2009, there have been no crude oil spills of 100 gallons or more in the License Area. One historic contaminated site is listed on ADEC's contaminated sites database, which is located at the Federal Aviation Administration site in the old townsite of Katalla (ADEC 2020b, a). The ADEC commonly cites the primary causes of spills of crude oil by volume as line failure, equipment failure, human error, containment overflow, and tank failure (ADEC 2020b). Although there are risks associated with spills resulting from exploration, production, storage, and transportation of oil and gas, these risks can be mitigated through prevention and response plans such as the Unified Plan and Subarea Contingency Plans (ARRT 2018).

In Alaska, one of the most significant recent oil and gas facility spill responses was for BP's H-08 flowline leak on April 28, 2014. The flowline ruptured releasing natural gas and produced water

onto the snow-covered tundra. Approximately 1,600 cubic yards of contaminated snow and 1,788 barrels of meltwater and associated fluids were recovered and disposed. In fiscal year 2014, there were 41 produced water spills totaling 96,736 gallons; 527 diesel spills totaling 67,889 gallons and 68 aviation fuel spills totaling 18,855 gallons. There were also 21 process water spills totaling 14,385 gallons and 28 spills of drilling muds totaling 14,209 gallons. In that same year, natural gas and oil production facilities accounted for the most spills based on facility types, together totaling 138,225 gallons. These two facility types comprised 49 percent of all spills reported in Alaska in fiscal year 2014 (ADEC 2015).

In fiscal year 2018, the most significant spill from an oil and gas facility was from Hilcorp's July 25, 2017 injection line failure at Endicott which released 13,650 gallons of produced water to the environment. Also, in fiscal year 2018, ConocoPhillips Alaska Inc., reported a 7,500-gallon produced water spill from an equipment failure at Kuparuk's central processing facility. Approximately 16 percent of the releases were from oil production facilities and 25 percent of the releases were from bulk fuel terminal facilities. Oil production ranked third behind mining operations and military installations in terms of volume spilled during the 2018 fiscal year (ADEC 2018b).

### **a. Drilling**

One form of spill from drilling operations can occur during a well blowout. A well blowout can take place when high pressure is encountered in the well and sufficient precautions, such as increasing the weight of the drilling mud, are not effective. The result is that oil, gas, water and/or mud is suddenly and violently expelled from the wellbore, followed by uncontrolled flow from the well. Blowout preventers with built in redundancies to immediately close off the open well to prevent or minimize any discharges, are required for all drilling and work-over rigs and are routinely inspected by the AOGCC to prevent such occurrences.

Major offshore oil and gas accidents are rare events, but when they occur effects can be substantial. The *Deepwater Horizon* rig was finishing work after drilling the Macondo exploration well in the Gulf of Mexico in 2010, when a kick escalated to a blowout, followed by a series of explosions and fire. Eleven men died and nearly 5 million barrels of oil were discharged into the gulf (BOEMRE 2011). The central cause of the Macondo blowout was identified as the failure of the cement barrier in the production casing string that allowed hydrocarbons to flow up the wellbore coupled with failure of the crew to detect the kick and failure of the blowout preventer to contain the well (BOEMRE 2011).

The AOGCC held hearings on drilling safety to determine whether changes to regulations were necessary in the aftermath of the *Deepwater Horizon* incident. The primary findings were that regulators should demand a safety culture; eliminate regulatory complexity; conduct inspections, enforce regulations, and monitor performance; keep the focus on regulating; and require a blowout contingency plan. AOGCC concluded that many of these recommendations were already in place in Alaska (PAME 2014).

Blowouts are extremely rare in Alaska and their numbers decline worldwide as technology, experience, and regulations influence drilling practices. The AOGCC regulations set forth a comprehensive well permitting process and rigorous well operations inspection program. It also has

a program to ensure well failures or blowouts do not occur. Drilling plans and procedures are scrutinized to assess potential problems within rock formations and the drilling fluids used to control downhole pressure. Well construction is evaluated, and rigs are inspected before permission to drill is granted.

## **b. Offshore Transportation**

Alaska's largest oil spill was the March 1989 *Exxon Valdez* tanker spill in Prince William Sound, the second largest spill recorded in United States waters. It spilled nearly 10.8 million gallons of crude oil, contaminated fishing gear, fish and shellfish, killed marine birds and mammals, and led to the closure or disruption of many Prince William Sound, Cook Inlet, Kodiak, and Chignik fisheries (Alaska Office of the Governor 1989; Graham 2003; University of North Carolina At Chapel Hill 2003; City of Valdez 2017). Effects of oils spills on fish and wildlife are discussed in Chapter Eight.

Other large tanker spills in Alaska include the 1987 tanker Glacier Bay spill of 2,350 to 3,800 barrels of North Slope crude oil being transported to Cook Inlet for processing at the Nikiski Refinery. Less than 10 percent of the oil was recovered, and the spill interrupted commercial fishing activities near Kalgin Island during the peak of the sockeye salmon run (ADEC 1988).

Both incidents demonstrated that preventing large tanker spills is easier than cleaning them up, and that focused legislative attention on the prevention and cleanup of oil spills on both the federal and state levels. At the state level, statutes created the oil and hazardous substance spill response fund (AS 46.08.010), established the Spill Preparedness and Response (SPAR) Division of ADEC (AS 46.08.100), and increased financial responsibility requirements for tankers or barges carrying crude oil up to a maximum of \$100 million (AS 46.04.040(c)(1)). Currently the financial responsibility for tankers or barges is \$187,100,000 as of October 1, 2017, as adjusted to the Consumer Price Index for Anchorage (AS 46.04.045(a)).

## **c. Pipelines**

Both state and federal agencies have oversight of pipelines in Alaska. State agencies include the ADEC and DO&G, which includes the State Pipeline Coordinator's Section. Federal agencies include the PHMSA within the US Department of Transportation and the Bureau of Safety and Environmental Enforcement within the US Department of the Interior. Additionally, there is the Joint Pipeline Office which consists of a variety of state and federal agencies that oversee Trans-Alaska Pipeline System (TAPS).

The pipeline system that transports North Slope crude are typical of most oil production facilities which include flowlines that carry oil, gas, and produced water to processing facilities; transmission pipelines that carry oil to Pump Station 1, where it is delivered to TAPS for transport to the marine terminal at the Port of Valdez. These pipelines vary in size, length, and content. As an example, a 14-inch pipeline can store about 1,000 barrels per mile of pipeline length. Under static conditions, if oil were lost from a 5-mile stretch of 14-inch pipeline (a hypothetical distance between emergency block valves), a maximum of 5,000 barrels of oil could be discharged if the entire volume of oil in the segment drained from the pipeline.

### **3. Spill and Leak Prevention**

Several measures contribute to the prevention of oil spills during the exploration, development, production, and transportation of crude oil. Some of these prevention measures are included as mitigation measures in Chapter Nine. Prevention measures are also described in the oil discharge and contingency plans that the industry must prepare before beginning operations. Thorough training, well-maintained equipment, and routine surveillance are important components of oil spill prevention.

The oil industry employs, and is required to employ, many techniques and operating procedures to help reduce the possibility of spilling oil, including use of existing facilities and roads; water body protection, including proper location of onshore oil storage and fuel transfer areas; use of proper fuel transfer procedures and secondary containment, such as impermeable liners and dikes; and appropriate siting of facilities and pipelines. Additionally, there are some newer technologies and tools that help prevent and mitigate large spills such as employing pipeline leak detection and well blowout prevention.

#### **a. Blowout Prevention**

Blowout preventers greatly reduce the risk of a gas release. If a release occurs, the released gas will dissipate unless it is ignited by a spark (Florence et al. 2011). Each well has a blowout prevention program that is developed before the well is drilled. Operators review bottom-hole pressure data from existing wells in the area and seismic data to learn what pressures might be expected in the well. Engineers use this information to design a drilling mud program with enough hydrostatic head to overbalance the formation pressures from the surface to the total depth of the well. Engineers also design the casing strings to prevent various formation conditions from affecting well control performance. Blowout preventer (BOP) equipment is installed on the wellhead after the surface casing is set and before actual drilling begins. BOP stacks are equipped with redundancies in place to quickly shut the well in and are routinely tested in accordance with government requirements. Under 20 AAC 25.035, AOGCC regulates compliance with blowout prevention requirements.

Under 18 AAC 75.425(I) the plan holder must be able to stop the flow to the surface within 15 days. If well control is lost and there is an uncontrolled flow of fluids at the surface, a well control plan is devised. The plan must include instituting additional surface control measures, igniting the blowout, or drilling a relief well. Regaining control at the surface is faster than drilling a relief well and has a high success rate. Operators may pump mud or cement down the well to kill it, replace failed equipment, remove part of the BOP stack and install a master valve, or divert the flow and install remotely-operated well control equipment (BPXA 1996).

#### **b. Leak Detection**

Leak detection systems and effective emergency shut-down equipment and procedures are essential in preventing discharges of oil from any pipeline that might be constructed in the License Area. These systems protect the public and the environment from consequences of a pipeline failure. Pipeline operators are alerted when a leak occurs, so that appropriate actions can be taken to minimize spill volume and duration. Leak detection methods vary from simply compare “metered out” product volumes with “metered in” volumes or more complex computational monitoring

systems that simultaneously monitor numerous operating conditions. In most cases, pipeline operators will employ two or more different types of leak detection systems to improve the effectiveness of their leak detection program (USDOT 2018).

The technology for monitoring pipelines is continually improving. Leak detection methods may be categorized as hardware-based (optical fibers or acoustic, chemical, or electric sensors) or software-based (to detect discrepancies in flow rate, mass, and pressure). Leak detection methods include acoustic monitoring, pressure point analysis, ultrasound, radiographic testing, magnetic flux leakage, the use of coupons, regular ground and aerial inspections with forward looking inferred radar (FLIR), and combinations of some or all the different methods. The approximate location of a leak can be determined from the sensors along the pipeline. A computer network is used to monitor the sensors and signal any abnormal responses. In recent years, computer-based leak detection through a Real-Time Transient Model has come into use, to mathematically model the fluid flow within a pipe (Scott and Barrufet 2003). Modern pipeline systems are operated from control centers with computer connectivity and satellite and telecommunication links to strive for rapid response and constant monitoring of pipeline conditions (NRC 2003).

Design and use of “smart pigs,” data collection devices that are run through the pipeline while it is in operation, have greatly enhanced the ability of a pipeline operator to detect internal and external corrosion and differential pipe settlement in pipelines. Pigs can be sent through the pipeline on a regular schedule to detect changes over time and give warning of any potential problems. Three types of pigs are used. A caliper pig is used to measure internal deformation such as dents or buckling. A geometry pig records configuration of the pipeline system and determines displacement. A wall thickness pig measures the thickness of the pipeline wall. All can provide early warnings of weaknesses where leaks may occur (NRC 2003).

## **4. Oil Spill Response**

Spill preparedness and response practices for the License Area are driven primarily by the plan holder’s ODPCP, which must align with the requirements of the RCP and ACP for the operational area. The ACP for this area is the Prince William Sound ACP. Overall response planning is accomplished by a coordinated and cooperative effort by government agencies (ADEC 2018a; ARRT 2018). The effectiveness and safety of a potential spill response is a concern in the License Area because of the nature of the exposed coastline, alongshore currents that flow toward the Copper River delta, and mitigation measures that restrict oil and gas exploration, development, and activities to November through March. During these winter months storms with high winds and waves are more prevalent, with stronger winds and larger waves that are doubled compared to spring through early fall. Seasonal activity restrictions combined with locally harsh weather conditions may increase the risk of accidents during exploration, development, and production activities.

### **a. Incident-Command System**

The Incident Command System (ICS) is scalable and is activated in the event of an actual or potential oil or hazardous material spill. The ICS system is designed to organize and manage responses to incidents involving several jurisdictional or interested parties in a variety of activities. Since oil spills usually involve multiple jurisdictions, the federal, state, and responsible party

implement ICS through a unified command structure in the oil and hazardous substance discharge ICS. The unified command consists of the FOSC, the State On-Scene Coordinator (SOSC), and the responsible party On-Scene Coordinator. If there is risk to local public safety, a Local On-Scene Coordinator will be designated. The ICS is organized around five major functions: command, planning, operations, logistics, and finance/administration (ARRT 2018).

The Unified Command jointly makes decisions on objectives and response strategies; however, only the Incident Commander is responsible for implementing these objectives and response strategies. If the responsible party is known, the responsible party Incident Commander remains in charge until or unless the FOSC and SOSC decide that the responsible party is not doing an adequate job of response (ARRT 2018).

## **b. Response Teams**

The Alaska Regional Response Team (ARRT) is composed of representatives from 15 federal agencies and one representative agency from the State of Alaska. The ARRT is co-chaired by the USCG and EPA, while the ADEC represents the state. The team provides coordinated federal and state response policies to guide the FOSC in responding effectively to spill incidents. The Statewide Oil and Hazardous Substance Incident Management System Workgroup, which consists of the ADEC, industry groups, spill cooperatives, and federal agencies, published the *Alaska Incident Management System* (AIMS) for oil and hazardous substance response (ARRT 2018).

Each operator identifies a spill response team for their facility, and each facility must have an approved ODPCP. Company teams provide on-site, immediate response to a spill event. First, responders attempt to stop the flow of oil and may deploy booms to contain oil that has entered the water. Responders may deploy booms to protect major inlets, wash-over channels, and small inlets. Deflection booming may be placed to enclose smaller bays and channels to protect sensitive environmental areas. If the nature of the event exceeds the facility's resources, the responsible party calls in its response organization. The spill response team:

- identifies the threatened area;
- assesses the natural resources, i.e., environmentally sensitive areas such as major fishing areas, spawning or breeding grounds;
- identifies other high-risk areas such as offshore exploration and development sites and tank-vessel operations in the area;
- obtains information on local tides, currents, prevailing winds, and ice conditions; and
- identifies the type, amount, and location of available equipment, supplies, and personnel.

It is especially important to prevent oil spills from spreading rapidly over a large area. Cleanup activities may continue as long as necessary, without any time frame or deadline.

## **c. Training**

Individual members of the spill response team train in basic spill response; skimmer use; detection and tracking of oil; oil recovery on open water; river booming; radio communications; all-terrain vehicle, snowmobile, and four-wheeler operations; oil discharge, prevention, and contingency plan



review; communication equipment operations; open water survival; oil spill burning operations; pipeline leak plugging; and spill volume estimations.

#### **d. Response Organizations**

Primary Response Action Contractors (PRAC) and Oil Spill Response Organizations (OSRO) may play an important role in a spill response. PRACs and OSROs are organizations that may enter into a contractual agreement with a responsible party, assisting the responsible party in spill cleanup operations. PRACs and OSROs can provide equipment, trained personnel, and additional resources. The Operations/Technical Manuals maintained by the RACs and OSROs may be referenced in vessel or facility contingency plans and serve as supplementary reference documents during a response. PRACs and OSROs generally have access to large inventories of spill equipment and personnel resources. The FOSC or SOSC may contract these assets for use (ARRT 2018).

Alaska Chadux Corporation (Chadux) is the main PRAC/OSRO operating in Prince William Sound and to the east in the License Area and was formed in 1993 in accordance with the federal Oil Pollution Act of 1990. Chadux assists companies distributing and transporting petroleum product comply with required oil spill prevention measures. From its headquarters in Anchorage, Chadux is also able to deploy rapid response teams to contain, control, and clean-up petroleum spills. Chadux has 17 equipment hubs throughout Alaska used for quick mobilization in the case of a spill, providing equipment and personnel for all response services. Chadux has an equipment hub in Cordova, and the closest hub to the License Area. Chadux also offers various spill response and restoration training along with preparation exercises (ACC 2018).

Operators of various facilities contract with Chadux for response activities. The USCG designates Chadux as a Tier 3 OSRO, which is the highest level of designation and is based on spill containment and removal requirements for an offshore and ocean response. Chadux is registered with the State of Alaska as a PRAC and as a Non-Tank Vessel Cleanup Contractor and maintains response centers in Prince William Sound. In the event of a spill, the response center serves as the emergency operations center for all federal, state, and industry personnel.

In mid-2018 Edison-Chouest Offshore (ECO) of Louisiana replaced Crowley Marine Services as Alyeska's Ship Escort/Response Vessel System contractor in Alaska. Services provided by this contract include operation of escort tugs, general purpose tugs, oil recovery storage barges, and associated personnel to escort tankers on their transits of Prince William Sound. ECO has built or is currently building 13 new vessels for the contract: five escort tugs, four general purpose tugs, and four open water barges. New technology onboard the tugs will include: render-recover winches, a sophisticated technology that automatically maintains constant tension on a line improving safety and performance during towing. The tugs will also have FLIR and digital radar signal processing systems to improve floating ice detection as well as enhancing the ability to detect spilled oil on water should prevention measures fail. New open ocean response barges will have Crucial and Ocean Buster skimmers, the latest in skimming technology and equipment. ECO will have one offshore anchor handling utility vessel, the Ross Chouest, which is proposed as the Hinchinbrook sentinel 17-mile standby tug.

Other OSROs may operate in Prince William Sound if they meet USCG and ADEC standards. Each organization may operate a little differently, but the objective is the same – to minimize the impact

of an oil spill. Some OSROs maintain mutual aid agreements with other operators so that if the spill exceeds their individual capabilities, they may access other resources.

Response actions vary greatly with the nature, location and size of the spill. General response activities may include:

- Locate and stop the spill if possible;
- Estimate the spill amount, determine the substance's chemistry, and estimate the trajectory;
- Determine what equipment would most effectively recover spilled oil;
- Mobilize appropriate equipment to confine spilled oil or to protect especially sensitive areas from oiling; and
- Assess the damage to oiled areas, develop a plan for cleanup, and implement it.

### **e. Geographic Response Strategies**

Geographic Response Strategies (GRS) are oil spill response strategies for protecting specific sensitive areas from the effects of oil following a spill. The purpose of these map-based strategies is to save time during the critical first few hours after an oil spill. They provide the location of some sensitive areas and one way to deploy oil spill protection equipment. However, environmental conditions at GRS sites frequently change depending on season, storm impact, erosion, substrate redistribution, and other factors. Therefore, GRS are intended to be flexible, allowing spill responders to modify them as prevailing conditions dictate (ADEC 2019).

A workgroup composed of local spill response experts and the state and federal agencies developed the GRS with public input. Sites were selected based on environmental sensitivity, risk of being impacted from a water borne spill, feasibility of successfully protecting the site with existing technology, and local significance. Strategies focus on minimizing environmental damage, using as small a footprint as possible to support the response operations, and selecting sites for equipment deployment. Within the Prince William Sound area, there are five geographic response zones. The License Area is on the southeastern side of the Copper River delta zone that stretches from the eastern portion of Hinchinbrook Island to the Okalee Spit on the eastern edge of the License Area. Because a GRS has not been developed for a sensitive site does not imply that the site would not be protected during an oil spill response. The strategies and tactics developed for pre-identified GRS sites may be applicable to other sensitive areas that need to be protected from an actual spill (ADEC 2019).

## **5. Cleanup and Remediation**

Cleanup plans for crude oil spills on terrestrial and wetland ecosystems must balance the objectives of maximizing recovery and minimizing ecological damage. Many past cleanup operations have caused as much or more damage than the oil itself. All oils are not the same, and knowledge of the chemistry, fate, and toxicity of the spilled oil can help identify cleanup techniques that can reduce the ecological impacts of an oil spill. Hundreds of laboratory and field experiments have investigated the fate, uptake, toxicity, behavioral responses, and population and community responses to crude oil (Jorgenson and Cater 1996).

Oil spills can affect freshwater and marine environments as well. The effects of an oil spill into a marine or other surface water environment are dependent on factors including the flow rate, wave action, and temperature of the water. Cleaning spilled oil from shorelines can be a difficult task with many variables that determine the techniques that are most effective and environmentally responsible. Some physical methods that are employed include deploying booms and sorbent material to contain the spill; wiping the shore with adsorbent materials; pressure washing to mobilize the contaminant; or raking and bulldozing to remove the impacted material (EPA 1999).

The best techniques are those that quickly remove volatile aromatic hydrocarbons. This is the portion of oil that causes the most concern regarding the physical fouling of birds and mammals. To limit the most serious effects, it is desirable to remove the maximum amount of oil as soon as possible after a spill. The objective is to promote ecological recovery and not allow the ecological effects of cleanup to exceed those caused by the spill itself.

After a spill, the physical and chemical properties of the individual constituents in the oil begin to be altered by the physical, chemical, and biological characteristics of the environment; this is called weathering. The factors that are most important during the initial stages of cleanup are the evaporation, solubility, and movement of the spilled oil. As much as 40 percent of most crude oils may evaporate within a week after a spill. Over the long term, microscopic organisms (bacteria and fungi) break down oil (Jorgenson and Cater 1996).

Following an oil spill in a marine or surface water environment, a Shoreline Cleanup and Assessment Technique (SCAT) team may be deployed by the Unified Command to evaluate shoreline types, impacted shorelines, and the degree and type of oiling. The SCAT method provides guidelines for decision making and prioritization of cleanup of coastlines during the response to an oil spill. The SCAT process includes eight basic steps:

- Conduct reconnaissance surveys,
- Segment the shoreline,
- Assign teams and conduct SCAT surveys,
- Develop cleanup guidelines and endpoints,
- Submit survey reports and oiling sketches to the Incident Command planning section,
- Monitor effectiveness of cleanup,
- Conduct post-cleanup inspections, and
- Conduct final evaluation of cleanup activities.

The SCAT teams consider the resources that are present along the shore and try to maximize the value of the recovery effort while balancing that with the safety of the oil spill responders. SCAT surveys are a preliminary step in the spill response process to assess initial shoreline conditions and continue in advance of operational cleanup. Surveys continue throughout the response to verify the effectiveness of the cleanup efforts and to ensure they meet cleanup endpoints. They evaluate the potential for human exposure as well as the nature and extent of the environmental impacts of the oil in place. In some instances, attempts to remediate a shoreline can be more harmful than allowing the spilled product to naturally attenuate (NOAA 2018).

Cleanup stages include initial response, remediation, and restoration. During initial response, the responsible party gains control of the source of the spilling oil; contains the spilled oil; protects the natural and cultural resource; removes, stores and disposes of collected oil; and assesses the condition of the impacted areas. During remediation, the responsible party performs site and risk assessments; develops a remediation plan; and removes, stores, and disposes of more collected oil. Restoration attempts to re-establish the ecological conditions that preceded the spill and usually includes a monitoring program to assess the results of the restoration activities (Jorgenson and Cater 1996).

## **6. Hazardous Substances**

Hazardous substances are identified as a large range of elements, compounds, and substances regulated by the EPA, USCG, ADEC, and other government agencies. In addition to petroleum products, waste products, toxic water pollutants, hazardous air pollutants, hazardous chemical substances, and other products presenting an imminent danger to public health or welfare are identified for prevention from release and response in cases of spills. AS 46.03.826(5). ADEC, USCG, and EPA monitor and inspect operations and facilities to enforce compliance with preventative measures to ensure safe use and storage of hazardous substances (ADEC 2018a). Mitigation measures have been developed to minimize releases or spills during oil and gas operations and can be found in Chapter Nine.

Spill response protocols are well established in Prince William Sound. ADEC, USCG and EPA – Region 10 have established guidelines for operations in the event of a major response effort to an oil spill or hazardous material release in the Prince William Sound Area Contingency Plan. Any release of a hazardous substance must be reported by a responsible party as soon as the person has knowledge of the discharge. The release must be reported to the National Response Center and the ADEC, and response protocols must be initiated. There are several safeguards in place to react quickly to hazardous releases or oil spills. Coordination, trained personnel, and technological advances can be employed quickly to address the occasions when releases occur (ADEC 2018a).

It is essential for those in command to recognize and identify the substance released for safe containment. An initial characterization of the hazard during the evaluation phase of containment requires an assessment of potential threat to public health and environment, need for protective actions, and protection of response personnel. A more comprehensive characterization will follow if necessary. In certain cases, local or state entities have the authority to order evacuations beginning with those living or working in downwind or in low-lying areas. Response personnel will secure sites, establish control points, and establish work zones. The Local On-Scene Coordinator is in command and control until he or she determines an imminent threat to public safety no longer exists. While the largest volume of transport hazard substances are natural gas and crude oil, agency coordination between federal, state, and local entities are equipped to contain and manage releases of all hazardous substances present in the License Area (ADEC 2018a).

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# Chapter Seven: Governmental Powers to Regulate Oil and Gas

## Contents

	<b>Page</b>
A. State of Alaska .....	7-1
1. Department of Natural Resources (DNR).....	7-2
a. Plan of Operations Approval.....	7-2
b. Pipeline Rights-of-way .....	7-2
c. Temporary Water Use Authorization.....	7-2
d. Permit and Certificate to Appropriate Water .....	7-2
e. Land Use Permits .....	7-3
f. Material Sale Contract .....	7-3
g. Office of History and Archaeology (OHA) .....	7-3
2. Alaska Department of Environmental Conservation (ADEC).....	7-4
a. Interference with Salmon Spawning Permits .....	7-4
b. Air Quality Permits .....	7-4
i. Title I (NSR) Construction Permits .....	7-5
ii. Title V Operations Permits .....	7-5
iii. Other Requirements .....	7-6
c. Solid Waste Disposal Permit.....	7-6
d. Wastewater Disposal Permit .....	7-7
e. APDES Discharge Permits and Certification.....	7-7
f. Industry Oil Discharge Prevention and Contingency Plans .....	7-7
3. Alaska Department of Fish and Game (ADF&G).....	7-8
a. Fish Habitat Permit .....	7-8
b. Special Area Permit .....	7-8
4. Alaska Oil and Gas Conservation Commission (AOGCC) .....	7-9
a. Permit to Drill .....	7-9
b. Underground Injection Control Program (UIC).....	7-9
c. Annular Disposal of Drilling Waste.....	7-10
d. Disposal Injection Orders.....	7-10
e. Area Injection Orders.....	7-10
f. Flaring Oversight .....	7-10
5. Department of Labor and Workforce Development (DOLWD).....	7-10
B. Federal .....	7-11
1. Environmental Protection Agency (EPA) .....	7-11
a. Air Quality Permits .....	7-11
b. Hazardous Waste (RCRA) Permits.....	7-11
c. National Pollutant Discharge Elimination System Discharge Permit.....	7-11
d. Underground Injection Control (UIC) Class I and II Injection Well Permits .....	7-11
2. US Army Corps of Engineers .....	7-12
3. Pipeline and Hazardous Materials Safety Administration (PHMSA).....	7-12
4. US Fish and Wildlife Service.....	7-13
5. National Marine Fisheries Service .....	7-13
6. US Coast Guard .....	7-14
C. Other Federal and State Regulatory Considerations .....	7-14
1. Regulations of Oil Spill Prevention and Response.....	7-14

2. Alaska National Interest Lands Conservation Act (ANILCA) .....7-15

3. Native Allotments.....7-15

D. References .....7-16

## Chapter Seven: Governmental Powers to Regulate Oil and Gas

AS 38.05.035(g)(1)(B)(v) requires the director to consider and discuss the governmental powers to regulate the exploration, development, production, and transportation of oil and gas or gas only. Oil and gas activities are subject to numerous federal, state and local laws, regulations, policies, and ordinances. Each licensee is obligated to comply with all federal, state, and local laws. Regulatory agencies may have different roles in the oversight and regulation of oil and gas activities, and some agencies may have overlapping authorities with other agencies.

Most oil and gas activities require individual authorizations regardless of the phase (disposal, exploration, and development and production) with which they are associated. Common oil and gas activities associated with exploration requiring prior authorization include seismic surveys, development of drill pads, and drilling exploration wells. In the development and production phase, common activities requiring prior authorization include construction of pads, roads, support facilities, and drilling development wells. In the production phase, common oil and gas activities requiring prior authorization include constructing and operating processing facilities, construction of transmission pipelines, flowlines, and above-ground storage tanks. The likely methods of transportation in the production and development phase are focused on moving oil and gas, and regulatory authorities tend to shift toward monitoring activities and facilities in the field to ensure post-disposal oil and gas activities are conducted as approved. These phases are not always sequential and associated oil and gas activities may occur at any point throughout the project. The completion of one phase does not automatically trigger the beginning of a new phase.

This chapter is not intended to provide a comprehensive description of the multitude of laws and regulations that may be applicable to oil and gas activities. However, its intent is to display the broad spectrum of government agencies authorized to prohibit, regulate, and condition oil and gas activities which may ultimately occur as a result of the issuance of the Gulf of Alaska exploration license. Actual processes, terms, conditions, and required authorizations will vary with time and certain, site-specific operations, and the activities discussed in the previous paragraph are not all inclusive. Licensees are responsible for knowing and complying with all applicable federal, state, and local laws, regulations, policies, ordinances, and the provisions of the license. Some, but not all, of the major permits and approvals required by each agency are discussed below.

### **A. State of Alaska**

The State of Alaska has several agencies that approve, oversee, or coordinate activities related to oil and gas exploration, development, production, and transportation. The licensee is required to keep the area open for inspection by authorized state officials. Several state agencies including the Alaska Department of Natural Resources (DNR), Alaska Department of Environmental Conservation (ADEC), Alaska Department of Fish and Game (ADF&G), and Alaska Oil and Gas Conservation Commission (AOGCC) may monitor field operations for compliance with each agency's terms. The agencies and their authorities are set forth below.

## **1. Department of Natural Resources (DNR)**

The Alaska Department of Natural Resources (DNR) reviews, coordinates, conditions, and approves plans of exploration, or operations and other permits as required before on-site activities can take place. The DNR monitors activities through field inspections once they have begun. Each plan of operations is site-specific and must be tailored to the activity requiring the permit. Applicable fees for DNR permits and applications are outlined in 11 AAC 05.010.

### **a. Plan of Operations Approval**

Oil and gas operations undertaken on or in the License Area are regulated by 11 AAC 83.158 and 11 AAC 83.346. An application for approval of a plan of operations must contain sufficient information for DO&G to determine the surface use requirements and impacts directly associated with the proposed operations. Amendments may be required as necessary but DO&G will not require an amendment that is inconsistent with the terms of the exploration license. The terms and conditions of the license, including amendments to the plan of operations, are attached to the plan of operations approval and are binding on the licensee. In addition to an approved plan of operations, a bond must be furnished to DNR in accordance with 11 AAC 83.160 before starting operations.

### **b. Pipeline Rights-of-way**

The DO&G State Pipeline Coordinator's section is the lead state agency for processing pipeline right-of-way leases under AS 38.35, the Right-of-Way Leasing Act. This responsibility includes coordination of the state's efforts related to the federal right-of-way process. The State Pipeline Coordinator also coordinates the state's oversight of preconstruction, construction, operation and termination of jurisdictional pipelines.

### **c. Temporary Water Use Authorization**

Temporary water use authorizations may be required for oil and gas activities. The Division of Mining, Land, and Water (DMLW) administers temporary water use authorizations as required under 11 AAC 93.035 before (1) the temporary use of a significant amount of water, (2) if the use continues for less than five consecutive years, and (3) the water applied for is not otherwise appropriated. The volume of water to be used and permitted depends upon whether it is for consumptive uses, and the duration of use. The authorization may be extended one time for good cause for a period of time not to exceed five years.

The authorization is subject to conditions and may be suspended or terminated if necessary, to protect the water rights of other persons or the public interest. Information on lake bathymetry, fish presence, and fish species may be required when winter water withdrawal is proposed to calculate the appropriate withdrawal limits.

### **d. Permit and Certificate to Appropriate Water**

Industrial or commercial water use requires a Permit to Appropriate Water under 11 AAC 93.120. The permit is issued for a period consistent with the public interest and adequate to finish construction and establish full use of water. The maximum duration for this permit is five years,

unless the applicant proves, or the commissioner independently determines, a longer time is required. The commissioner may issue a permit subject to terms, conditions, restrictions, and limitations necessary to protect the rights of others, and the public interest. Under 11 AAC 93.120(e), permits are subject to conditions to protect fish and wildlife habitat, recreation, navigation, sanitation or water quality, prior appropriators, or any other purpose DNR determines is in the public interest.

#### **e. Land Use Permits**

DO&G issues land use permits, such as a geophysical permit or a miscellaneous land use permit, under 11 AAC 96.010. Geophysical exploration permits are required for all geophysical and exploration activity in the License Area.

Seismic surveys are the most common activity authorized by this permit. The purpose of the permit is to minimize adverse effects on the land and its resources while making important geological information available to the state (11 AAC 96.210).

A \$100,000 bond is required to conduct seismic work. The bond amount for other geophysical surveys is determined when the activity is proposed. A geophysical exploration permit contains measures to protect the land and resources of the area.

The DMLW issues land use permits to manage surface uses and activities on state public domain land and to minimize adverse effects on the land and its resources under 11 AAC 96. Land use permits may be issued for a period of up to five years depending on the activity and may be revoked at will or for cause in accordance with 11 AAC 96.040. Generally allowed uses on state land are subject to the conditions set out in 11 AAC 96.025.

#### **f. Material Sale Contract**

If the licensee or operator proposes to use state-owned gravel or other materials for construction of pads and roads, DMLW requires a material sale contract (11 AAC 71). The contract must include, at a minimum, a description of the License Area, the materials to be extracted, the volume of material to be extracted, the method of removal of the material, the bonds and deposits required of the purchaser, and the purchaser's liability under the contract. The material sale contract must also include the purchaser's site-specific operating requirements (11 AAC 71.200).

A contract may be extended if the DMLW director determines the delay in completing the contract is due to unforeseen events beyond the purchaser's control, or the extension is in the state's best interests (11 AAC 71.20).

The DMLW director may require the purchaser to provide a performance bond guaranteeing performance of the terms of the contract. If required, the bond amount is based on the total value of the sale and must remain in effect for the duration of the contract unless released in writing by the DMLW director (11 AAC 71.095).

#### **g. Office of History and Archaeology (OHA)**

The Office of History and Archaeology (OHA) performs the work of the State Historic Preservation Office pursuant to the National Historic Preservation Act of 1966 (OHA 2018a). OHA follows the

state's historic preservation plan in maintaining the Alaska Heritage Resources Survey (AHRS). The historic preservation plan guides preservation activities in the state from 2018 through 2023 (OHA 2018b).

AHRS is an inventory of all reported historic and prehistoric sites within the state. This inventory includes objects, structures, buildings, sites, districts, and travel ways, with a general guideline that the sites are over 50 years old. The fundamental use of the AHRS is to protect cultural resource sites from unwanted destruction (AHRS 2018). Before beginning a multi-phase development project, information regarding important cultural and historic sites should be obtained by contacting OHA. The AHRS data sets are "restricted access documents" and site-specific location data should not appear in final reports or be distributed to others.

AS 41.35.010 enables the state to preserve and protect the historic, prehistoric, and archaeological resources of Alaska from loss, desecration, and destruction so the scientific, historic, and cultural heritage embodied in these resources may pass undiminished to future generations. Further, the historic, prehistoric, and archaeological resources of the state are properly the subject of concerted and coordinated efforts exercised on behalf of the general welfare of the public, so these resources may be located, preserved, studied, exhibited, and evaluated.

## **2. Alaska Department of Environmental Conservation (ADEC)**

ADEC has the statutory responsibility to conserve, improve, and protect Alaska's natural resources and environment, by regulating air, land, and water pollution, and oil spill prevention and response. ADEC implements and coordinates several federal regulatory programs in addition to state laws (ADEC 2018b).

### **a. Interference with Salmon Spawning Permits**

ADEC is responsible for issuing permits for activities that interfere with salmon spawning streams and waters. Activities that may potentially obstruct, divert, or pollute waters of the state used by salmon in the propagation of the species, or that may interfere with the free passage of salmon must first apply for and obtain a permit before beginning any work (AS 16.10.010).

Permits may be granted if ADEC finds the purpose of the permit is to develop power, obtain water for civic, domestic, irrigation, manufacturing, mining, or other purposes with the intent to develop the state's natural resources. The applicant may also be required to construct and maintain adequate fish ladders, fishways, or other means by which fish may pass over, around, or through the dam, obstruction, or diversion in the pursuit of spawning.

### **b. Air Quality Permits**

ADEC administers the federal Clean Air Act (42 U.S.C. §§7401-7671 et seq.) and the state's air quality program under the federally approved State Implementation Plan (AS 46.14; 18 AAC 50). Through this plan, federal requirements of the Clean Air Act are met, including National Ambient Air Quality Standards (NAAQS), Non-Attainment New Source Review (N-NSR), New Source Performance Standards (NSPS), National Emission Standards for Hazardous Air Pollutants

(NESHAP), and Prevention of Significant Deterioration (PSD). Additionally, ADEC monitors air quality and compliance.

NAAQS set limits on certain pollutants (called criteria pollutants) considered harmful to public health and the environment. NAAQS have been established for: carbon monoxide, lead, nitrogen dioxide, particulate matter (PM<sub>10</sub>), small particulate matter (PM<sub>2.5</sub>), ozone, ammonia, and sulfur dioxide. NSR and PSD, a permitting program required for the review of new sources, new construction projects, or modifications to an existing facility, ensures that air quality is not degraded by the new project, and that large, new, or modified industrial sources are as clean as possible (EPA 2018d). NSPS are intended to promote the use of the best air pollution control technologies available, and account for the cost of technology and any other non-air quality, health and environmental impact, and energy requirements (EPA 2018b). NESHAPs are set for air pollutants (air toxics) that are not covered by NAAQS, but that may be harmful (EPA 2018c). The standards are categorized by type of source and require the maximum degree of reduction in emissions that is achievable, as determined by the US Environmental Protection Agency (EPA).

Title I Construction Permits, and Title V Operations Permits are the two primary types of permits issued to meet air quality requirements. These permits specify what activities are allowed, what emission limits must be met, and may specify how the facility must be operated. The permits contain monitoring, recordkeeping, and reporting requirements to ensure that the applicant meets the permit requirements (ADEC 2018c).

#### ***i. Title I (NSR) Construction Permits***

Title I permits refer specifically to air construction permits and minor source specific permits for certain activities such as the PSD program as well as other requirements of the Clean Air Act. This permit must be obtained before onsite construction may begin. Operators of existing and new facilities who propose to construct or modify a stationary source may need to apply for either a construction or minor source specific permit. Title I permits are required for projects that are new major sources for pollutants, or major modifications at existing sources. PSD requires installation of the “Best Available Control Technology,” an air quality analysis, and additional impacts analysis and public involvement (EPA 2018e).

The process for a Title I permit can take up to three years, depending on the amount of pre-construction meteorological or pollutant monitoring data that must be collected. Once a complete Title I permit application is submitted, ADEC strives to issue Title I minor permits within 130 days. Title I PSD permits can take up to 18 months to issue once a complete permit application is received. Article 5 of 18 AAC 50 contains the regulations covering Title I minor permits. Article 3 of 18 AAC 50 contains the regulations covering the Title I PSD permits. With a few exceptions, ADEC has adopted the federal PSD permit program under 40 CFR 52.21 by reference.

#### ***ii. Title V Operations Permits***

The federal Clean Air Act gives EPA authority to limit emissions from air pollution sources after the source has begun to operate. EPA regulations require facilities that emit certain pollutants or hazardous substances to obtain a permit to operate the facility, known as a Title V permit. In Alaska, ADEC is responsible for issuing Title V permits and making compliance inspections (AS 46.14; 18 AAC 50). The permit establishes limits on the type and amount of emissions,

requirements for pollution control devices and prevention activities, and requirements for monitoring and record keeping (ADEC 2018c).

If a Title V permit is required, a permittee has up to one year after becoming a major source to submit a complete Title V permit application. Operations can continue while ADEC processes the application (the application shield) if the application is both timely and complete. However, significant revisions to an existing permitted facility cannot be made until ADEC approves the permit revision. Processing time for permit revisions can generally take up to six months. Title V permits and revisions can be processed concurrently with Title I permits. Article 3 of 18 AAC 15 contains the regulations covering Title V permits. With a few exceptions, ADEC has adopted the federal operating permit program under 40 CFR Part 71 by reference.

### ***iii. Other Requirements***

ADEC also operates ambient air quality monitoring networks under the Clean Air Act to assess compliance with NAAQS for carbon monoxide, particulates, nitrogen dioxide, sulfur oxide, and lead; assesses ambient air quality for ambient air toxics levels; provides technical assistance in developing monitoring plans for air monitoring projects; and issues air advisories to inform the public of hazardous air conditions (ADEC 2018a). ADEC provides oversight for operators that must collect air and meteorological monitoring data to meet air permit requirements.

Operators in Alaska are required to minimize the volume of gas released, burned, or permitted to escape into the air (20 AAC 25.235(c)). Operators must report monthly to AOGCC any flaring event lasting over an hour. The AOGCC investigates these incidents to determine if there was unnecessary waste (AOGCC 2006). More information is provided in Section 4 below.

## **c. Solid Waste Disposal Permit**

ADEC regulates solid waste storage, treatment, and disposal under 18 AAC 60. The EPA administers the Resource Conservation and Recovery Act (RCRA) relating to hazardous wastes and Underground Injection Control (UIC) Class I injection wells. AOGCC regulates UIC Class II oil and gas waste management wells.

ADEC requires a comprehensive plan for all solid waste disposal facilities that it regulates. Solid waste permit applications are reviewed for compliance with air and water quality standards, wastewater disposal, drinking water standards, and consistency with the Alaska Historic Preservation Act before approval. A comprehensive facility plan is required and includes specific engineering design criteria and a discussion demonstrating how the various design features (liners, berms, dikes) will ensure compliance with regulations.

Disposal of waste in Municipal Solid Waste Landfills (MSWLFs) is regulated under 18 AAC 60.300-398. Other solid waste disposal facilities that accept primarily one type of solid waste are regulated as monofill under 18 AAC 60.400-495. An inactive reserve pit is a historic, generally unlined drilling waste disposal area that operated prior to 1996 and is required to be closed under 18 AAC 60.440. Currently 95 percent of the identified inactive reserve pits have met closure requirements.



Waste storage, treatment, and land applications facilities also require permits under 18 AAC 60. Permit applications include detailed reviews of design and operations to ensure that the facilities will perform their planned function, comply with other ADEC regulations, and be protective of health, safety and the environment. Typical permitted treatment facilities include municipal solid waste incinerators and treatment facilities for medical waste, sewage solids, and drilling waste (prior to underground injection).

Hazardous waste storage, treatment, and disposal facilities are permitted and regulated by EPA. Currently, no hazardous waste disposal facilities are permitted in Alaska. If a hazardous waste management facility is proposed for Alaska, ADEC is responsible for a review of the facility siting under 18 AAC 63, although no specific program is designated to perform the review.

#### **d. Wastewater Disposal Permit**

Domestic graywater must be disposed of properly at the surface and requires a wastewater disposal permit (18 AAC 72). Monitoring records must be available for inspection, and a written report may be required upon completion of operations.

#### **e. APDES Discharge Permits and Certification**

ADEC administers the Alaska Pollution Discharge Elimination System (APDES) program (ADEC 2015, 2018e). This program regulates discharges of pollutants into United States waters by “point sources,” such as industrial and municipal facilities. Permits are designed to maximize treatment and minimize harmful effects of discharges. The APDES covers a broad range of pollutants, which include any type of industrial, municipal, and agricultural waste discharged into water.

APDES permits may be general or individual. General permits cover multiple facilities that have similar wastewater characteristics in a defined area. Individual permits are issued to a single facility and the terms, limits, and conditions are specifically tailored for that facility and circumstances. An APDES permit is effective for a period not exceeding five years and must be renewed before it expires.

#### **f. Industry Oil Discharge Prevention and Contingency Plans**

ADEC regulates spill prevention and response under AS 46.04.030. ADF&G and DNR support the ADEC in these efforts by providing expertise and information. Oil discharge prevention and contingency plans (contingency plans) must be filed with ADEC before beginning operations. DNR reviews and provides comments to ADEC regarding the adequacy of these contingency plans.

Contingency plans for exploration facilities must include a description of methods for responding to and controlling blowouts, the location and identification of oil spill cleanup equipment, the location and availability of suitable drilling equipment, and an operations plan to mobilize and drill a relief well. Holders of approved plans are required to have sufficient oil discharge containment, storage, transfer, cleanup equipment, personnel, and resources to meet the response planning standards for the particular type of facility, pipeline, tank vessel, or oil barge (AS 46.04.030(k)). If development and production follow, additional contingency plans must be approved for each facility before activity commences.

Discharges of oil or hazardous substances must be reported to ADEC. The report must record the volume released, whether the release is to land or to water, and whether the release has been contained by secondary containment or a structure. The discharge must be cleaned up to ADEC's satisfaction. ADEC will modify proposed cleanup techniques or require additional cleanup techniques for the site as it determines to be necessary to protect human health, safety, welfare, and the environment (18 AAC 75.335(d)).

Contingency plans must describe existing and proposed means of oil discharge detection, including surveillance schedules, leak detection, observation wells, monitoring systems, and spill-detection instrumentation (AS 46.04.030; 18 AAC 75.425(e)(2)(E)). Contingency plans must include: a Response Action Plan, a Prevention Plan, and Supplemental Information to support the response plan, including a Best Available Technology Section (18 AAC 75.425). Operators must also provide proof of financial ability to respond to damages (AS 46.04.040).

### **3. Alaska Department of Fish and Game (ADF&G)**

ADF&G, Habitat, evaluates the potential effect of any activity on fish and wildlife, their habitat, and the users of those resources. ADF&G manages approximately 750 active fisheries, 26 game management units, and 32 special areas. Habitat's mission is to protect Alaska's valuable fish and wildlife resources and their habitats as Alaska's population and economy continue to expand. For activities in the License Area, fish habitat and hazing permits may be required.

#### **a. Fish Habitat Permit**

Under AS 16.05.841–871, ADF&G has the statutory responsibility for protecting freshwater anadromous fish habitat and providing free passage for anadromous and resident fish in freshwater bodies and any activity or project that is conducted below the ordinary high-water mark of an anadromous stream. These activities include, but are not limited to, construction and maintenance for bridges and culverts, stream diversion, water withdrawal, stream crossing, material removal, and blasting. ADF&G may attach additional stipulations to any permit authorization to mitigate potentially negative impacts of the proposed activity.

#### **b. Special Area Permit**

Under AS 16.20, authorization for land and water use activities that may impact fish, wildlife, habitats, or existing public use in any of the refuges, sanctuaries, or critical habitat areas designated by the Alaska State Legislature, may require a special area permit. Examples of activities requiring a special area permit include, but are not limited to, construction or placement of structures, damaging or clearing vegetation, detonation of explosives, natural resource development, or energy exploration, and any activity that is likely to have a significant effect on vegetation, drainage, water quality, soil stability, fish, wildlife, or their habitat, or which disturbs fish or wildlife (5 AAC 95.420). The ADF&G may require a mitigation plan pursuant to 5 AAC 95 when deemed necessary.

## **4. Alaska Oil and Gas Conservation Commission (AOGCC)**

AOGCC is an independent, quasi-judicial agency of the State of Alaska established under the Alaska Oil and Gas Conservation Act, AS 31.05.005. The AOGCC's regulatory authority is outlined in 20 AAC 25.

AOGCC acts to prevent waste, protect correlative rights, improve ultimate recovery, and protect underground freshwater. It issues permits, orders, and administers the UIC program for enhanced oil recovery and underground disposal of oil field waste. AOGCC serves as an adjudicatory forum for resolving certain oil and gas disputes between owners, including the state (AOGCC 2018).

### **a. Permit to Drill**

Under AS 31.05.090, AOGCC is authorized to issue permits to drill. Any licensee wishing to drill a well for oil, gas, or geothermal resources must first obtain a permit to drill from AOGCC. This requirement applies to exploratory, stratigraphic test and development wells, and injection and other service wells related to oil, gas, and geothermal activities. Typically, operating companies have obtained approval from all other concerned agencies by the time an operator, as defined by 20 AAC 25.990(46), applies to the AOGCC for a permit to drill. The application must be accompanied by the items set out in 20 AAC 25.005(c).

Under 20 AAC 25.015, once a permit to drill has been approved, the operations detailed in the permit to drill application must not be changed without additional approval from the AOGCC. After issuance of a permit to drill, information on the surface and proposed bottom-hole locations and the identity of the license, pool, and field for each well is published as part of the AOGCC's weekly drilling report (AOGCC 2018).

### **b. Underground Injection Control Program (UIC)**

The goal of the UIC program under the federal Safe Drinking Water Act is to protect underground sources of drinking water from contamination by oil and gas (Class II) injection activities. The UIC program requires the AOGCC to verify the mechanical integrity of injection wells, determine if appropriate injection zones and overlying confining strata are present, determine the presence or absence of freshwater aquifers and ensure their protection, and prepare quarterly reports of both in-house and field monitoring for EPA. Through a Memorandum of Understanding with EPA, AOGCC has primacy for Class II wells in Alaska, including oilfield waste disposal wells, enhanced oil recovery wells, and hydrocarbon storage wells.

AOGCC reviews and takes appropriate action on proposals for the underground disposal of Class II oil field wastes (20 AAC 25.252). Before receiving approval, an operator must demonstrate that injected fluids will not move into freshwater sources. Disposal or storage wells must be cased, and the casing cemented in a manner that will isolate the disposal or storage zone and protect oil, gas, and freshwater sources. Once approved, liquid waste from drilling operations may be injected through a dedicated tubing string into the approved subsurface zone. The pumping of drilling wastes through the annular space of a well is an operation incidental to drilling of the well and is not a disposal operation subject to regulation as a Class II well (AOGCC 2018).

### **c. Annular Disposal of Drilling Waste**

An AOGCC permit is required if waste fluid is to be injected into a well annulus. The material must be muds and cuttings incidental to the drilling of a well. AOGCC considers the volume, depth, and other physical and chemical characteristics of the formation designated to receive the waste.

Annular disposal is not permitted into water bearing zones where dissolved solids or salinity concentrations fall below predetermined threshold limits. Waste not generated from a hydrocarbon reservoir cannot be injected into a reservoir (AOGCC 2018).

### **d. Disposal Injection Orders**

Under 20 AAC 25.252, operators may apply for disposal injection orders to dispose of waste in individual wells. After the public review process and AOGCC's analysis, an order may be issued that approves the proposed disposal project (AOGCC 2018).

### **e. Area Injection Orders**

Injection orders may be issued on an area basis rather than for individual wells in areas where greater activity is anticipated (20 AAC 25.402). The area injection orders describe, evaluate, and approve subsurface injection on an area wide basis for enhanced oil recovery and disposal purposes (AOGCC 2018).

### **f. Flaring Oversight**

The goal of the flaring oversight program is the elimination of unnecessary flaring whenever possible in accordance with 20 AAC 25.235. Operators are required to report all flaring events lasting longer than one hour to AOGCC. Flaring events over one hour are analyzed and investigated if necessary. The operator may be penalized if it is determined that waste has occurred (AOGCC 2018).

## **5. Department of Labor and Workforce Development (DOLWD)**

Recent studies of the state's workforce by the Alaska Department of Labor and Workforce Development (DOLWD) identified the need to increase the supply of skilled construction workers available in the state. In response, Governor Walker signed Administrative Order No. 278 (AO 278) to increase opportunities for on-the-job training through monitoring the use of apprentice workers on state-financed construction projects and improve the available pool of skilled construction workers. AO 278 directed DNR to consider ways to encourage licensees and lessees developing minerals, including oil and gas, on state-owned land to employ apprentices for work performed on the licensed or leased area. In February 2019, Alaska Governor Michael J. Dunleavy rescinded AO 278 by AO 309.

DOLWD also administers some delegated authorities of the Occupational Safety and Health Administration (OSHA) Section 18 of the OSHA Act of 1970 allows states to obtain approval to assume responsibility for development and enforcement of federal occupational safety and health standards. The DOLWD has obtained approval from OSHA for administration of some of the federal OSHA standards (DOLWD 2016; OSHA 2018).

## **B. Federal**

### **1. Environmental Protection Agency (EPA)**

EPA implements, administers, or oversees programs required by federal environmental laws and regulations. The implementation of some programs has been delegated to the states to safeguard the air, land, and water.

#### **a. Air Quality Permits**

ADEC administers the federal Clean Air Act and the air quality program for the State of Alaska under a federally-approved state implementation plan (EPA 2018a). For more information, see section 2(b) above.

#### **b. Hazardous Waste (RCRA) Permits**

The federal RCRA regulates the management of solid waste, hazardous waste, and underground storage tanks holding petroleum products or certain chemicals (40 CFR 264.175(b)-(c)). Regulations set the parameters for transporting, storing, and disposing of hazardous wastes and for designing and operating treatment, storage, and disposal facilities safely (40 CFR 264.193(b)). Regulations are enforced through inspections, monitoring of waste handlers, taking legal action for noncompliance, and providing compliance incentives and assistance (EPA 2017).

Some states may receive authorization to administer parts of the program, which requires that state standards be at least as strict as federal standards. EPA administers the RCRA program in Alaska.

#### **c. National Pollutant Discharge Elimination System Discharge Permit**

The National Pollutant Discharge Elimination System (NPDES) discharge permit is required under the federal Clean Water Act, although its administration may be delegated to a state agency. ADEC administers this EPA program within state waters, under the APDES (see Section 2(e) above). However, EPA retains responsibility for issuing NPDES permits in Alaska for facilities within Denali National Park, outside of state waters, on tribal lands, and facilities subject to Clean Water Act Section 301(h) waivers. Both ADPES and NPDES permits specify the type and amount of pollutant, and include monitoring and reporting requirements, so that discharges do not harm water quality or human health.

#### **d. Underground Injection Control (UIC) Class I and II Injection Well Permits**

The EPA regulates injection wells used to dispose of fluid pumped into the well. Authorized as part of the federal Safe Drinking Water Act of 1974, the EPA's UIC program protects underground sources of drinking water from being contaminated by the waste injected in the wells. Injection wells are categorized into five classes; Classes I and II are most common in the oil and gas industry. The EPA administers the program for Class I wells in Alaska, and authority for Class II oil and gas wells has been delegated to AOGCC (see Section D).

All injections falling into Class I must be authorized through the EPA's UIC Class I program. Class I wells must operate under a permit that is valid for up to 10 years. Permits stipulate requirements

such as siting, construction, operation, monitoring and testing, reporting and record keeping, and closure. Requirements differ for wells depending on whether they accept hazardous or non-hazardous wastes.

## **2. US Army Corps of Engineers**

The US Army Corps of Engineers (USACE) has regulatory authority over construction, excavation, or deposition of materials in, over, or under navigable waters of the United States, or any work which would affect the course, location, condition, or capacity of those waters (Rivers and Harbors Acts of 1890 (superseded) and 1899 (33 U.S.C. 401, et seq.; 33 U.S.C. 403). Section 10 permits cover oil and gas activities, including exploration drilling from jack-up drill rigs and installation of production platforms (USACE 2018a).

Section 404 of the Clean Water Act regulates discharge of dredged and fill material into United States waters and wetlands. This program is administered by USACE, which is authorized to issue Section 404 permits for discharging dredge and fill materials.

Permits issued for specific projects are the basic type of permit issued. General permits (including programmatic, nationwide, and regional general permits) authorize activities that are minor and will result in minimal individual and cumulative adverse effects. General permits carry a standard set of stipulations and mitigation measures. Letters of permission, another type of project authorization, are used when the proposed project will not have significant individual or cumulative environmental impacts, and appreciable opposition is not expected (USACE 2018b).

In making a final decision on whether to issue a permit, USACE considers conservation, economics, aesthetics, wetlands, cultural values, navigation, fish and wildlife values, water supply, water quality, and other factors judged important to the needs and welfare of the people (USACE 2018a).

ADEC reviews Section 404 and 10 permit applications for compliance with Alaska water quality standards. If the applications comply, ADEC approves the permit.

Permits may also be reviewed by other agencies, such as EPA, US Fish and Wildlife Service (USFWS), and National Marine Fisheries Service (NMFS), to ensure compliance with the Endangered Species Act (ESA), the National Environmental Policy Act, and Essential Fish Habitat Provisions of the Magnuson-Stevens Act (USACE 2018a).

## **3. Pipeline and Hazardous Materials Safety Administration (PHMSA)**

The federal Office of Pipeline Safety (OPS) in the Pipeline and Hazardous Materials Safety Administration (PHMSA), an agency of the US Department of Transportation, regulates movement of hazardous materials by pipeline (PHMSA 2018). PHMSA inspectors review technical issues on hazardous liquid pipelines in Alaska. The 2016 PIPES Act requires hazardous liquid pipeline operators to develop integrity management programs for transmission pipelines (PHMSA 2016).

Jurisdictional authority over pipelines depends on many factors such as design, pipe diameter, product transported, or whether it meets state or federal designation, e.g., transmission line, gathering line, or distribution line, and other attributes as specified in regulations. Generally, the design, maintenance, and preservation of transmission pipelines transporting hydrocarbon products are under the authority and jurisdiction of PHMSA with specific federal regulations for natural gas (49 CFR 192) and hazardous liquids (49 CFR 195). Both regulations prescribe the minimum requirements that all operators must follow to ensure the safety of their pipelines and piping systems. The regulations not only set requirements, but also provide guidance on preventive and mitigation measures, establish time frames for upgrades and repairs, development of integrity management programs, and incorporate other relevant information such as standards, incorporated by reference, developed by various industry consensus organizations.

#### **4. US Fish and Wildlife Service**

The US Fish and Wildlife Service (USFWS) is a federal agency within the Department of the Interior dedicated to conservation, protection, and management of fish, wildlife, and natural habitats. USFWS has management authority for migratory birds, threatened and endangered species, the national wildlife refuge system, aquatic resources, and landscape conservation (USFWS 2015). USFWS issues incidental take permits under the ESA for a limited set of marine mammals such as polar bears, walrus, and sea otters, as well as freshwater and terrestrial endangered species. Incidental take permits with respective habitat conservation plans are required when non-federal activities will result in take of threatened or endangered species (USFWS 2013).

#### **5. National Marine Fisheries Service**

The National Marine Fisheries Service (NMFS) is an office of the National Oceanic and Atmospheric Administration within the US Department of Commerce. NMFS has jurisdiction over dolphins, porpoises, whales, sea lions, and seals protected under the Marine Mammal Protection Act (MMPA) and the ESA (NOAA Fisheries 2018c). NMFS issues permits and authorizations under the MMPA and ESA for activities that may result in the take or harassment of marine mammals (NOAA Fisheries 2018b). NMFS is also tasked with conservation and enhancement of Essential Fish Habitat (EFH) under the Magnuson-Stevens Act (NOAA Fisheries 2018a).

Under provisions of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), a fishery management plan (FMP) must describe and identify EFH for federally managed fish stocks and identify other actions to encourage the conservation and enhancement of EFH. Such recommendations may include measures to avoid, minimize, mitigate, or otherwise offset adverse effects on EFH.

Under section 305(b)(4)(A) of the MSA, NMFS is required to provide EFH Conservation Recommendations to Federal and state agencies for actions that would adversely affect EFH. Although state agencies are not required to consult regarding EFH, NMFS will coordinate with the state to produce EFH Conservation Recommendations to promote the conservation of EFH in the review of state actions that may adversely affect EFH (50 CFR § 600.925(c)).

The proposed project area includes habitats designated as EFH for all five species of Pacific salmon, many species of groundfish, and Weathervane scallops. NMFS created an EFH mapper to provide spatial data and maps of EFH for species managed by the North Pacific Fishery Management Council <https://www.fisheries.noaa.gov/resource/map/alaska-essential-fish-habitat-efh-mapper>. Additional information on the FMPs can be found at <https://www.npfmc.org>.

## **6. US Coast Guard**

The US Coast Guard (USCG) has authority to regulate oil pollution under 33 CFR §§ 153–157 in waters of the United States, and to make determinations on hazards to navigation under 33 CFR § 64.31. USCG may respond to discharges or threats of discharges of oil and hazardous substances into the navigable waters of the United States and promulgate certain pollution prevention regulations under 33 U.S.C. § 1321. USCG also has regulatory authority over offshore activities pursuant to the Outer Continental Shelf Lands Act. They are responsible for the regulation, inspection, and oversight of systems and subsystems on mobile offshore drilling units like jack-up rigs and drilling platforms. The USCG also evaluates hazards to navigation including artificial islands and pipelines. USCG regulates hazardous materials in commerce under U.S.C. Title 49. USCG safeguards fisheries and marine protected resources by enforcing living natural resource authorities like the Magnuson-Stevens Fisheries Conservation and Management Act (16 U.S.C. § 1801), the Lacey Act (16 U.S.C. §§ 3371–3378), the Endangered Species Act (16 U.S.C. §§ 1531–1544), and the National Marine Sanctuaries Act (16 U.S.C. §§ 1431–1445).

## **C. Other Federal and State Regulatory Considerations**

### **1. Regulations of Oil Spill Prevention and Response**

Section 105 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) (42 U.S.C. § 9605), and § 311(c)(2) of the Clean Water Act, as amended (33 U.S.C. § 1321(c)(2)) require environmental protection from oil spills. CERCLA and the Clean Water Act require a National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 CFR § 300; 33 U.S.C. § 1321(d)). Under the implementing regulations, a violator must plan to prevent and immediately respond to oil and hazardous substance spills and be financially liable for any spill cleanup. If the pre-designated Federal On-Scene Coordinator (FOSC) determines the response is neither timely nor adequate, the federal government may elect to respond to the spill absent adequate actions by the responsible party and if it so chooses, may seek to recover the costs of such response from the responsible party.

The Oil Pollution Act of 1990 (OPA 90) requires the development of facility and tank vessel response plans and an area-level planning and coordination structure to coordinate federal, regional, and local government planning efforts with the industry. OPA 90 amended the Clean Water Act (§ 311(j)(4); 33 U.S.C. § 1231(j)) and established regional citizen advisory councils (RCACs) and area contingency plans as the main parts of the national response planning structure.

The Alaska Regional Response Team is an advisory board to the FOSC. It provides processes for participation by federal, state and local governmental agencies to participate in response to



pollution incidents (ARRT 2014). The Alaska Regional Contingency Plan (RCP) serves as guidance to planners preparing for a coordinated federal, State, and local response to a discharge, or substantial threat of discharge of oil and/or a release of a hazardous substance from a vessel or on/offshore facility operating within Alaska's boundaries and surrounding waters. The FOSC and State On-Scene Coordinator (SOSC) use the RCP as guidance, in conjunction with the NCP, to inform and support the Area Committee within each planning area in building their Area Contingency Plan (ARRT 2018). The License Area is located within the Prince William Sound Area. The Prince William Sound Area Contingency Plan has been written jointly by the USCG and the ADEC, and it meets the requirements of the NCP and the RCP area contingency plan (ADEC 2018d).

## **2. Alaska National Interest Lands Conservation Act (ANILCA)**

The Alaska National Interest Lands Conservation Act (ANILCA) designated over 100 million acres of conservation system units across Alaska, which are each separately managed by one of four federal land management agencies, the National Park Service, the US Fish and Wildlife Service, the Bureau of Land Management and the USDA Forest Service. ANILCA includes numerous special provisions intended by Congress to balance the national interest in Alaska's vast scenic and wildlife resources with recognition of Alaska's developing economy and infrastructure, and distinctive rural way of life. The State, through its interagency ANILCA program, continues to closely monitor the implementation of ANILCA. State interests include the need for continued public access for traditional activities; guaranteed access to State and private inholdings within CSUs for economic and other uses; consideration of transportation and utility systems within or across CSUs; access for subsistence activities; and recognition of state authorities concerning fish, wildlife, navigable waterways, tidelands and submerged lands.

Title XI of ANILCA provides that Alaska's transportation and utility network is largely undeveloped and future needs for those systems should be identified through a cooperative effort involving the state and federal government, with public participation. The development of any transportation or utility corridors should be established to minimize any adverse impacts to the environment. Additionally, ANILCA requires drafting a timely environmental impact statement for a proposed utility or transportation corridor, prepared by all federal agencies with which the application was filed under.

## **3. Native Allotments**

Licensees must comply with applicable federal law concerning Native allotments. Activities proposed in a plan of operations must not unreasonably diminish the use and enjoyment of lands within a Native allotment. Before entering lands subject to a pending or approved Native allotment, licensees must contact the Bureau of Indian Affairs (BIA) and the Bureau of Land Management (BLM) and obtain approval to enter.

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# Chapter Eight: Reasonably Foreseeable Effects of Licensing and Subsequent Activity

## Contents

	<b>Page</b>
A. Introduction .....	8-1
B. Reasonably Foreseeable Cumulative Effects on Air .....	8-2
1. Potential Cumulative Effects on Air Quality .....	8-2
2. Mitigation Measures and Other Regulatory Protections .....	8-3
C. Reasonably Foreseeable Cumulative Effect on Water Resources and Water Quality .....	8-3
1. Potential Cumulative Effects on Water Quality .....	8-3
a. Surface Water .....	8-4
i. Fresh Waters .....	8-4
i. Marine and Estuarine Waters .....	8-4
b. Groundwater .....	8-5
2. Mitigation Measures and Other Regulatory Protections .....	8-6
D. Reasonably Foreseeable Cumulative Effects on Terrestrial and Freshwater Habitats and Fish and Wildlife Populations .....	8-7
1. Potential Cumulative Effects on Terrestrial Habitats and Wildlife Populations .....	8-7
a. Seismic Surveys .....	8-8
b. Development and Production .....	8-9
c. Discharges, Leaks, and Spills .....	8-10
2. Mitigation Measures and Other Regulatory Protections .....	8-11
3. Potential Cumulative Effects on Freshwater Habitats and Fish Populations .....	8-11
a. Seismic Surveys .....	8-11
b. Development and Production .....	8-12
c. Discharges, Leaks, and Spills .....	8-13
4. Mitigation Measures and Other Regulatory Protections .....	8-13
E. Reasonably Foreseeable Cumulative Effects on Coastal and Marine Habitats and Fish and Wildlife Populations .....	8-14
1. Potential Cumulative Effects on Coastal and Marine Habitats .....	8-15
a. Seismic Surveys .....	8-15
b. Development and Production .....	8-15
c. Discharges, Leaks, and Spills .....	8-16
2. Mitigation Measures and Other Regulatory Protections .....	8-17
3. Potential Cumulative Effects on Marine and Anadromous Fish Populations .....	8-18
a. Seismic Surveys .....	8-18
b. Development and Production .....	8-19
c. Discharges, Leaks, and Spills .....	8-19
4. Mitigation Measures and Other Regulatory Protections .....	8-21
5. Potential Cumulative Effects on Coastal and Marine Wildlife Populations .....	8-21
a. Seismic Surveys .....	8-22
b. Development and Production .....	8-24
c. Discharges, Leaks, and Spills .....	8-25
6. Mitigation Measures and Other Regulatory Protections .....	8-27
F. Reasonably Foreseeable Cumulative Effects on Fish and Wildlife Uses .....	8-27
1. Potential Cumulative Effects on Subsistence .....	8-28
2. Potential Cumulative Effects on Commercial and Sport Fishing, Hunting and Trapping .....	8-28

3. Mitigation Measures and Other Regulatory Protections .....	8-30
G. Reasonably Foreseeable Cumulative Effects on Historic and Cultural Resources.....	8-31
1. Potential Cumulative Effects on Historic and Cultural Resources .....	8-31
2. Mitigation Measures and Other Regulatory Protections .....	8-32
H. Reasonably Foreseeable Fiscal Effects of the Disposal and Subsequent Activity on the State and Affected Municipalities and Communities.....	8-32
1. Fiscal Effects on the State .....	8-32
a. Royalties .....	8-34
b. Rents .....	8-34
c. State Corporate Income Tax .....	8-34
d. Oil and Gas Property Tax.....	8-35
e. Production Tax.....	8-35
f. Alaska Permanent Fund .....	8-35
g. Public School Trust Fund.....	8-35
2. Fiscal Effects on Municipalities and Communities.....	8-35
a. Property Tax.....	8-36
b. Community Assistance Program.....	8-36
c. Employment.....	8-36
I. Other Reasonably Foreseeable Effects on Municipalities and Communities Near the License Area....	8-37
1. Access .....	8-37
2. Recreation and Tourism .....	8-37
3. Mitigation Measures and Other Regulatory Protections .....	8-38
J. Mitigation Measure Evaluation .....	8-38
K. References .....	8-39

# Chapter Eight: Reasonably Foreseeable Effects of Licensing and Subsequent Activity

Nearly a century of oil and gas activities in Alaska have had a range of effects on the environment. As effects are understood, measures are taken to prevent and mitigate reasonably foreseeable effects resulting from oil and gas activities. The Division of Oil and Gas (DO&G) has cooperatively developed mitigation measures that the licensee must follow to minimize pollution and habitat degradation, and disturbances to fish and wildlife, subsistence users, commercial and sport fisheries, and communities within and adjacent to the Gulf of Alaska exploration license area (License Area). Further, post-disposal authorizations may be subject to additional project-specific and site-specific mitigation measures that the director deems necessary to protect the state's interest. Despite these protective measures, adverse effects may occur. Alaska statutes specify that speculation about possible future effects is not required (AS 38.05.035(h)). Therefore, reasonably foreseeable potential cumulative effects of post-disposal oil and gas activities are considered and discussed below as required by AS 38.05.035(g) with brief summaries of measures to mitigate these reasonably foreseeable effects. See Chapter Nine for a complete listing of the mitigation measures for the License Area.

## A. Introduction

Under AS 38.05.035(g)(1)(B)(vi), the director is required to consider and discuss the reasonably foreseeable cumulative effects of post-disposal oil and gas activities on the License Area including: effects on fish and wildlife habitat and populations; subsistence and other uses; and historic and cultural resources. Under AS 38.05.035(g)(1)(B)(ix), the director is required to consider and discuss facts material to the reasonably foreseeable fiscal effects of the exploration license on the state and affected municipalities and communities. The director must also consider and discuss facts material to the reasonably foreseeable effects of exploration, development, production and transportation of oil and gas on municipalities and communities within and adjacent to the License Area under AS 38.05.035(g)(1)(B)(x).

An exploration license includes a specified work commitment expressed in dollars. This exploration license proposed a work commitment of \$1,000,000. The licensee's strategy and methods for expending this work commitment are variable and the director cannot predict whether the full commitment will be met in post-disposal activities. If a commercially viable deposit is found, development will require construction of one or more drill sites or production platforms. If commercial quantities of oil, gas, or both are located, construction of pipelines or offshore terminals may be likely, and additional production and transportation facilities may also be necessary.

Issuing the exploration license is not expected to have any effects other than to provide initial revenue to the state in the form of the \$1 per acre license fee. Reasonably foreseeable effects of oil and gas activities for the License Area were identified by describing the location and communities in Chapter Three; the habitats, fish, and wildlife in Chapter Four; and the current and projected uses in Chapter Five. This chapter analyzes potential effects on these receptors based on potential oil and gas activities within the License Area described in Chapter Six, with consideration of mitigation

measures in Chapter Nine and other regulatory requirements in Chapter Seven. Additional project-specific and site-specific measures may be required by other regulatory agencies, in response to public comments received during review of proposed activities in the form of a plan of operations.

## **B. Reasonably Foreseeable Cumulative Effects on Air**

Oil and gas exploration, development, and production include a wide range of activities and equipment that produce emissions and have the potential to affect air quality. The potential for cumulative effects on air quality arises primarily from engine emissions, generation of fugitive dust, methane emissions, and emissions of volatile organic compounds and nitrogen oxides. Combustion emissions are generated by construction equipment, vehicles and vessels, drilling rigs, and compressor engines. Fugitive dust and particulate matter can be generated by traffic as well as combustion (NPC 2011; Alvarez and Paranhos 2012).

Emissions from oil and gas activities typically include carbon monoxide; nitrogen oxides; sulfur dioxide; coarse and fine particulate matter; volatile organic compounds; ozone; and greenhouse gases including carbon dioxide, methane, and nitrous oxide (ADEC 2018a). In addition to these air pollutants, small quantities of hazardous pollutants including hydrogen sulfide, and compounds released during volatilization of oil and gas such as benzene, toluene, ethylbenzene, and xylenes may also be released (NPC 2011; Alvarez and Paranhos 2012). The US Environmental Protection Agency (EPA) and the Alaska Department of Environmental Conservation (ADEC), Division of Air Quality require industries with emissions that may affect air quality to control and reduce their air emissions such that Alaska and national ambient air quality standards are maintained. The oil and gas industry has developed best management practices and implemented control technologies where appropriate to meet regulatory requirements (NPC 2011).

### **1. Potential Cumulative Effects on Air Quality**

The main air pollutants of concern in Alaska are fine and coarse particulate matter, followed by carbon monoxide, lead, ozone, sulfur dioxide, and nitrogen oxides (ADEC 2017a). Emissions from combustion are the primary source of fine particulates. ADEC and EPA require an annual emissions inventory report for sources with potential emissions at or above 2,500 tons per year of sulfur oxide, nitrogen oxide, or carbon monoxide, and for annual emission of 250 tons for volatile organic compounds, ammonium, and for coarse and fine particulate matter (ADEC 2017b). Fuel-burning equipment, vehicles, and vessels; oil and gas storage, handling and transport; venting, flaring, and spills; and construction and traffic generated fugitive dust from oil and gas activities could cumulatively effect air quality within the License Area.

A 2005 ADEC survey of the 37 communities in the Valdez-Cordova Census Area showed carbon monoxide emissions of 7,404 tons, 690 tons of nitrogen oxide, 6,265 tons of large particulate matter, 1,973 tons of small particulate matter, and 26 tons of sulfur oxide. These do not include point sources, commercial marine, or aviation sources. These levels are considered relatively low compared to other parts of the state that were evaluated in the study. Emissions from wood burning and fugitive dust in these rural communities, however, lead the statewide inventory and the smaller ports and harbors like the communities in the Valdez-Cordova Census Area contribute significantly to the overall statewide marine emission inventory (Delaney and Dulla 2007).



## **2. Mitigation Measures and Other Regulatory Protections**

Oil and gas facilities and activities in the License Area are required to control and limit emissions. Combustion and fugitive emissions are minimized and mitigated by using best management practices and control technologies. Construction and traffic induced fugitive dust is minimized and mitigated by using best management practices such as construction area and road watering. Emissions associated with oil and gas activities would increase with exploration and subsequent development. Maximum concentrations of air pollutants occur close to facilities and disperse with air movements.

Any future oil and gas activities would be required to control emissions and maintain national and Alaska ambient air quality standards. Air quality standards are enforced by ADEC. Industry compliance with federal and state air quality regulations, particularly the Clean Air Act (42 U.S.C. §§ 7401-7671), AS 46.03, AS 46.14, and 18 AAC 50 are expected to prevent potential cumulative negative effects on air quality. Additional information regarding air quality permits and regulations can be found in Chapter Seven.

## **C. Reasonably Foreseeable Cumulative Effect on Water Resources and Water Quality**

Oil and gas activities that may affect water resources and water quality within the License Area include seismic exploration, overland transport, gravel mining, gravel road and pad construction, and water withdrawals to support drilling, construction, and operation activities. Effects include physical disturbances that could alter drainage patterns resulting in upslope impoundments and downslope drying, increases in turbidity and sedimentation from erosion and fugitive dust from gravel road traffic, drawdowns and contamination of groundwater, and contamination of freshwater and marine waters from discharges from well drilling and production, gas blowouts, or oil spills.

### **1. Potential Cumulative Effects on Water Quality**

Potential cumulative effects from oil and gas activities on water quality include contamination from discharges of drilling muds, cuttings, and produced water; increased turbidity from construction of roads, pads, and pipelines; and contamination from inadvertent release of fuel, oil, or gas. Potential cumulative effects on water quantity include water use from lakes, ponds or groundwater wells for construction and maintenance of roads and pads; for dust suppression; for mixing drilling muds; for potable, domestic, and fire suppression water supplies; and for industrial process and cooling water.

It is reasonable to expect oil and gas exploration, development and production in the License Area may require the construction and continued use of support facilities such as roads, production pads, pipelines, tank farms, docks and barge landings, and distribution terminals. In addition to the clearing of trees and vegetation cover, facility construction may require site preparation, placement of gravel fill, sheet and pile driving, and impoundment and diversion of surface water that may alter water quality and distribution through increased erosion, storm water runoff, and altered hydrology. Docks and barge landings may require initial and period dredging or screeding that increases turbidity (particulate matter suspended in water) and temporarily alters water quality. Although there is no monitoring due to remoteness, no waters in the License Area are identified as impaired.

Two water quality stations are located in the Copper River drainage, one in the western delta, and one farther upriver. ADEC has insufficient information to make an attainment or impairment determination for the Copper River. The nearest impaired waters are streams and beaches within Prince William Sound that remain impacted by the Exxon Valdez oil spill, and the nearest priority watershed is Eyak Lake at Cordova. Eyak Lake was previously listed as an impaired water due to petroleum hydrocarbons, oils, and grease from aboveground storage tanks and spills. Eyak Lake was removed from the impaired list in 2012 with a revised assessment of meeting water quality standards for designated uses (ADEC 2018c, 2020).

## **a. Surface Water**

### ***i. Fresh Waters***

The limited amount of land available for construction in the License Area includes several streams, river mouths, lakes, and ponds. The greatest potential for cumulative effects to freshwaters would be from construction of a cross-country export pipeline from the License Area to connect with the Trans Alaska Pipeline System. Turbidity of surface waters increases when sediment-laden runoff from pipeline construction or repair or road and facility construction flows into surface waters. Erosion from ground disturbing activities can result in elevated turbidity and increased sedimentation in nearby streams and lakes. This could lead to decreased fish productivity and habitat loss. Other activities that may affect surface water quality include accidental spills of fuel, oil, lubricants, or other hazardous chemicals. Most rivers in the License Area are glacially influenced, with high natural turbidity and high sediment loads during summer when glaciers are melting. Natural turbidity decreases during winter when freezing temperatures decrease glacial melt.

Discharges, spills, and leaks from oil and gas activities could affect freshwaters in the License Area, including surface waters and groundwater. Spill and leak prevention and response are addressed in Chapter Six. Natural oil seeps in the region may be locally important sources of petroleum contamination in wetlands and streams within and adjacent to the License Area. Discharges and freshwater use may result in cumulative effects to surface waters such as increased turbidity and sedimentation from activities associated with exploration, development, and production of oil and gas. Section C2 of this chapter discusses mitigation measures and other regulatory protections that are expected to avoid, minimize, and mitigate potential cumulative effects to freshwater quality and availability.

### ***ii. Marine and Estuarine Waters***

Oil and gas activities that could have cumulative effects on marine and estuarine water quality in the License Area include seismic surveys, discharges from well drilling, pipelines, construction of support facilities; dredging and screeding for docks and barge landings; and ongoing vessel berthing, loading, and traffic. Typical oil and gas discharges regulated under permits issued by ADEC and EPA include: drill cuttings, drilling fluids, deck drainage, hydrostatic test water, sanitary and domestic waste, desalination unit waste, blowout preventer fluid, boiler blowdown, fire control system test water, non-contact cooling water, ballast water, bilge water, excess cement, and chemically treated seawater discharges (EPA 2013).

Comprehensive field efforts in 2008 and 2009 to assess the cumulative effects of over 50 years of oil industry activities throughout Cook Inlet on water quality included studies to assess ecosystem health, produced water discharges, and background river sources (Saupe et al. 2012).

Anthropogenic sources of persistent organic pollutants and hydrocarbons in Cook Inlet include: oil and gas activities, municipal wastewater discharge, stormwater runoff, and spills; while natural sources of hydrocarbons in Cook Inlet include coal, oil seeps, and river and coastal erosion of hydrocarbon bearing formations (Savoie et al. 2012). While there was no evidence that water column hydrocarbons were associated with produced water discharges, other oil and gas activity, or recent product releases; volatile organic compound (benzene, ethylbenzene, toluene, and xylene) concentrations above water quality standards were identified at three locations in upper Cook Inlet (Savoie et al. 2012). Hydrocarbon fingerprinting found no evidence of polycyclic aromatic hydrocarbon accumulations from produced water discharges or recent spills but did identify background polycyclic aromatic hydrocarbon signature from the Alaska Peninsula to the Copper River delta potentially from peat/coal/source-rock inputs (Driskell and Payne 2012).

Discharging produced water or drilling fluids and cuttings to the ocean has the potential to affect the water column and the sea floor. Produced water typically contains high metal concentrations. Metals and hydrocarbons are the primary chemicals of concern in drilling fluids (or muds primarily composed of bentonite clay) and cuttings. Dispersal of discharged drilling fluids and cuttings depends on where in the water column the release occurs and current speeds. In general, the stronger the current at the release point, the further from the location drilling fluids and cuttings disperse. In Cook Inlet, metals in sediments and the water column were at background values with no detectable increases from discharges of produced water (Trefry et al. 2012). In the Beaufort Sea, sediment trace metal studies found minimal evidence for metals contamination, except near (within 656 feet) some 1981 to 2001 exploratory drilling sites where barium, chromium, copper, mercury, and lead concentrations were above background levels but within sediment quality criteria (Trefry and Neff 2019).

## **b. Groundwater**

Groundwater provides drinking water for about 50 percent of Alaska's population, and 90 percent of the Alaska's rural residents. Aquifers used for water sources are typically unconfined (i.e., not protected by a layer of clay or silt), and are at risk of contamination from spills of fuel and oil, and wastewater disposal from onsite septic systems (ADEC 2008). Petroleum products spilled on the ground may infiltrate through soils until they reach the water table, where the spill plume disperses and dilutes. Diesel and gasoline penetrate soils more readily than crude oil and are very difficult to cleanup once spills reach the water table (ADEC 2008). There are no public drinking water wells in or near the License Area.

Typical industrial use of groundwater could lower the water table elevation within a conic area surrounding industrial wells that can affect water depths in nearby domestic wells. These effects are usually insignificant and temporary as hydraulically connected groundwater sources infiltrate and replace the pumped volume. Groundwater withdrawal from aquifers confined at their lower boundaries induces leakage from streams while decreasing groundwater upwelling that maintains stream flows (Callegary et al. 2013). Reduction of in-stream flow may be of greater consequence during winter months when stream flows are maintained primarily by groundwater (Zenone and Anderson 1978).

Disposal wells, natural gas storage wells, and hydraulic fracturing of oil and gas wells can potentially effect groundwater quality through the introduction of contaminants into groundwater or aquifers (EPA 2016b; Schwartz 2016). Wells used for production, storage, or injection must demonstrate that barriers prevent any flow from the well to the surrounding rocks or the surface. Stringent construction requirements, pressure monitoring, and periodic integrity testing are required to ensure that underground sources of drinking water are protected (AOGCC 2015, 2016). Disposal wells are classified by use and waste type: Class I wells may be used for disposal of hazardous, non-hazardous industrial, municipal wastewater, and radioactive waste disposal (EPA 2016a). Class II underground injection wells are used for disposal of produced water which is usually a brine, for enhanced recovery through water flood, or for storage of liquid hydrocarbons associated with oil and natural gas production (EPA 2017). There are no Class I or Class II wells within or near the License Area (AOGCC 2020).

## **2. Mitigation Measures and Other Regulatory Protections**

Oil and gas activities such as exploration, development, production, and transportation could result in adverse effects to the water resources of the License Area. Many adverse effects could be lessened by mitigation but would not be eliminated completely. Most of the effects to water resources and water quality would result from oil and gas development, production and transportation activities, with construction of roads, stream-crossing structures, pads, dock and marine terminal, tanker or barge operations, runoff, and water use being the major contributors. Because offshore drilling and undersea pipelines seaward of the mean highwater line are prohibited, there would be no marine discharge of produced water, drilling muds or cuttings. Potential effects include changes in surface drainage due to construction of roads and pads, loss of wetlands and associated chemical and hydrologic functions, gravel mine development, and increased risk of spills and leaks.

Permits may contain stipulations on water use and withdrawal quantity to meet standards related to protection of recreation activities, navigation, water rights, or any other substantial public interest. Water use permits may also be subject to conditions, including suspension and termination of exploration activities, to protect fish and wildlife habitat, public health, or the water rights of other persons. New facilities are required to control and manage stormwater and snow melt runoff during construction and operation to avoid and minimize potential contamination. Groundwater protection is accomplished through regulation of contaminated sites, storage tanks, underground injection wells, spill response, and specific waste disposal activities under state and federal programs (ADEC 2008).

Water quality is not expected to be impacted by drilling muds, cuttings, produced waters, and other effluents associated with oil and gas exploration, development, and production because of permitting requirements for proper disposal and because drilling is only permitted from onshore locations. Permanent roads, large-scale fill of wetlands, and coastal and offshore facilities will require a Clean Water Act Section 404 permit and/or a Rivers and Harbors Act Section 10 permit. Effluents discharged by the oil and gas industry are regulated through ADEC's Alaska Pollution Discharge Elimination System (APDES) program (ADEC 2018d).

Measures in this best interest finding, along with regulations imposed by state, federal and local agencies are expected to avoid, minimize, and mitigate potential effects. Oil and gas activities in the License Area, limited to November 1 through March 31, could add turbidity to glacially influenced waters in months that are naturally low turbidity. Risk of oil spills, spill avoidance, and spill response planning are discussed in Chapter Six. A complete listing of mitigation measures can be found in Chapter Nine.

## **D. Reasonably Foreseeable Cumulative Effects on Terrestrial and Freshwater Habitats and Fish and Wildlife Populations**

Potential oil and gas activities that could have cumulative effects on terrestrial and freshwater habitats and fish and wildlife within the License Area include seismic surveys, construction of onshore support facilities, drilling activities, discharges from well drilling, transportation, and gas blowouts or oil spills. Some potential effects of these activities include physical changes and disturbance that could alter the landscape, water bodies, and wetlands; habitat availability and suitability; and behavior and abundance of fish and wildlife. Effects from transportation include habitat loss from pipeline and terminal construction, and potential fuel and oil leaks and spills. Existing and future oil and gas extraction carry the risk of spills, both small and large, within and outside the boundaries of the License Area.

Localized effects from small spills are generally limited to the direct damage to habitat and wildlife in the immediate vicinity representing a very small effect in relation to habitat and wildlife in the state, whereas large spills can have far reaching effects. Effects from spills become dispersed and potentially more significant when they occur within or near water because oil is more difficult to contain and recover from water than from land. A spill that contaminates groundwater could also result in impacts to freshwater streams and possibly intertidal areas. Indirect cumulative effects of oil and gas production can include artificial increases in numbers of predators such as gulls, ravens, raptors, bears, or foxes from access to garbage, cover, and perching habitats associated with camps and infrastructure, which can depress nesting success of ground-nesting birds in the surrounding area (Liebezeit et al. 2009; Wallace et al. 2016; Meixell and Flint 2017).

### **1. Potential Cumulative Effects on Terrestrial Habitats and Wildlife Populations**

Oil and gas activities may have cumulative effects on terrestrial habitats and wildlife, primarily related to habitat loss from construction of roads, pads, and facilities and habitat alteration from indirect effects resulting from construction and use of these facilities. Attributing potential cumulative effects from normal oil and gas activities to population level changes is often problematic as it is not usually possible to distinguish oil and gas activity effects alone from other potential sources of population variation. Some of the other factors include weather events, precipitation, and snow depth; flood, fire, vegetation succession, pest, and disease induced changes in habitat quality; disease outbreaks; immigration and emigration; predation, hunting, and highway traffic mortality; and habitat loss or alteration from other concurrent or adjacent land uses (Wasser et al. 2011; Brockman et al. 2017).

### **a. Seismic Surveys**

Past practices of clearing trees for seismic surveys created long linear corridors through forested habitats that can affect habitat quality and behavior of wildlife. The License Area is a temperate rainforest with Coastal Western Hemlock and Sitka Spruce forests. While this exact ecoregion has not been studied, studies of other forested habitats are instructive. In boreal forests, traditional 20 to 30-foot-wide seismic corridors can leave a long-lasting footprint (MacFarlane 2003). Modern seismic surveys clear either limited 6-foot-wide corridors or require no vegetation clearing which minimizes potential effects. Developments in wireless technology have resulted in further changes. In 2013, 25 percent of new seismic receiver equipment sold was wireless, and that percentage is expected to increase because of the associated cost savings and reduced environmental impacts associated with the technology (Rassenfoss 2013). Clearing for low impact lines does not necessarily recover any faster, and the length of time for natural plant communities to be restored on low impact lines is unknown (MacFarlane 2003). Alpine habitats dominated by slow growing lichens and dwarf shrubs are typically slow to recover from ground disturbances. Bog habitats that have been disturbed may take many years to return naturally to their pre-disturbance state (ADF&G 2006).

Besides potential long-term habitat damage, clearing operations to prepare seismic lines, seismic acquisition explosions, and human activity that occur during seismic surveys may cause short-term disturbance of wildlife. Wildlife can be particularly sensitive to disturbance during nesting and calving periods, but disturbances during winter when food resources are limited can be more problematic. Onshore seismic surveys would be limited to between November 1 and March 31. Bears in the License Area would be denning during winter; seismic acquisition explosions near den sites could disturb bears during hibernation such that they prematurely emerge from the den (Linnell et al. 2000). Mountain goats may use coastal forested habitats in the License Area during winter, and moose also winter in or near the License Area. Disturbance during winter, when forage resources are limited may result in increased energy expenditure and increased vulnerability to predation by wolves which could reduce survival and productivity of local mountain goats and moose (Neilson and Boutin 2017; White and Gregovich 2017).

A study evaluating songbird response to 20-foot-wide seismic line corridors concluded that overall abundance of songbirds, and the location and size of their territories were generally unaffected by seismic lines one year after clearing in boreal forests of the Northwest Territories. Only ovenbirds (*Seiurus aurocapilla*), which prefer large patches of closed canopy forests, showed a negative response to seismic lines. They declined in abundance, moved territories away from the disturbed habitat, and were not observed crossing the seismic lines. The landbirds of conservation concern potentially found within the License Area – olive-sided flycatcher, chestnut-backed chickadee, and rufous hummingbird – are not known to require large forest patches and may benefit from small forest openings that are typical of old-growth forests. Seismic surveys conducted in the License Area would most likely use newer technology that does not require clearing 20-foot-wide seismic line corridors. Reducing the width and prevalence of the seismic lines should minimize the effects on all songbird species (Machtans 2006).

Birds may be temporarily displaced by noise and disturbance from seismic surveys. The disturbances may impact migration staging, molting, and foraging habitats. Molting waterfowl are particularly vulnerable to disturbance as they cannot fly, and during migration waterfowl and

shorebirds have limited amounts of time to gain resources at staging areas to fuel migration (Gill and Tibbitts 1999; Lacroix et al. 2003; Colwell 2010; Taylor et al. 2010). Disturbance and displacement during migration and molting can reduce survival and productivity. Since oil and gas activity in the License Area would be limited to November 1 to March 31, migrating and molting waterfowl and shorebirds would not be present in the License Area and so would not be disturbed by seismic surveys.

## **b. Development and Production**

Cumulative effects of oil and gas activities on terrestrial habitats and wildlife are primarily related to habitat loss from construction of roads, pads, and facilities and habitat alteration from indirect effects resulting from construction and use of these facilities such as altered drainage patterns, fugitive dust, and changes in vegetation cover. Activities including vehicle traffic, aircraft traffic, sounds from equipment and machinery, and changes in vegetation types resulted in reduced use or avoidance of the area surrounding oil and gas facilities. Cumulative effects are primarily related to habitat impacts that include direct loss through cover by facilities and functional losses through habitat alteration and behavioral displacement away from facilities (Sawyer et al. 2009; Van Dyke et al. 2012; Thomas et al. 2014).

Development and production generally require construction and continued use of support facilities including roads, production pads, airstrips, gathering and transport pipelines, processing facilities, and living quarters for field personnel. In addition to clearing trees for construction, facilities may also require placement of gravel fill, and impoundment and diversion of water. Construction of new oil and gas facilities would likely be limited to the 1,180 acres of state-owned uplands in the northwestern corner of the License Area. Terrestrial and freshwater habitats in this location are used during spring and fall by waterfowl concentrations and shorebirds; during spring, summer, and fall by trumpeter swans, bald eagles and other waterfowl and landbirds; during salmon runs by bears; year-round by moose and furbearers; and likely during winter by mountain goats (ADF&G 1985).

Disturbance from vehicles and human activity at facilities can affect waterfowl nesting success (Meixell and Flint 2017). The presence of oil and gas facilities, human activity, and associated noise can alter bird use and lead to displacement, reduced productivity, and potentially reduced survival near infrastructure (Liebezeit et al. 2009; Francis and Barber 2013; Thomas et al. 2014; Yoo and Koper 2017).

Cumulative effects of activity and noise generated during oil and gas activities on wildlife are likely to lead to localized short-term disturbance and displacement effects during exploration and development, and localized long-term displacement effects during production of sensitive animals during sensitive periods such as nesting, denning, near parturition, and during winter (Linnell et al. 2000). Disturbance during winter when forage resources are limited may result in increased energy expenditure and increased vulnerability to predation by wolves that could reduce survival and productivity of local mountain goats and moose (Harris et al. 2014; Neilson and Boutin 2017; White and Gregovich 2017). Bears may also be attracted to industry facilities, which could increase bear-human interactions and lead to high incidental mortality of bears resulting from these interactions (Suring and Del Frate 2002).

### **c. Discharges, Leaks, and Spills**

Excluding oil spills, oil and gas activities during exploration, development, and production are considered to be minor contributors of petroleum hydrocarbons to the environment. Cumulative effects of discharges, leaks, and spills on terrestrial wildlife are largely related to loss of habitat owing to contamination, though some individual animals may be affected from acute toxic exposure (Huntington 2007). Oil spills may result in habitat degradation, changes in prey or forage availability, and contamination of prey or forage resources. Changes in preferred prey or forage may lead to displacement into lower quality habitats with reduced prey or forage, which can reduce survival or reproductive fitness (Henkel et al. 2012; Burns et al. 2014).

Factors contributing to the effects of oil spills on terrestrial habitats including the size of the spill, type of oil spilled, time of year, type of vegetation, and terrain. Spilled oil can spread both horizontally and vertically depending on the volume spilled, type of ground cover (plant or snow), slope, presence of cracks or troughs in the ground, moisture content of the soil, temperature, thickness of the oil, discharge point, and ability of the ground to absorb the oil (Linkins et al. 1984). Oil spreads less when it is thicker, cooler, or is exposed to chemical weathering. If the ground temperature is less than the pour point of the oil, it pools and is easier to contain. Because dry soils are more porous, the potential for spilled oil to seep downward into the soil is greater (Everett 1978). If oil penetrates the soil layers and remains in the plant root zone, longer-term effects, such as mortality or reduced regeneration could occur in following summers. Under the right conditions involving oxygen, temperature, moisture in the soil, and the composition of the spilled oil, bacteria may assist in the breakdown of hydrocarbons in soils.

The amount of time that contaminants remain in the soil depends on several factors, including: the type and quality of clay particles; type and concentration of solutes; organic content and composition; pH; and temperature. Hydrocarbon spills in boreal forests can have a range of potential effects, including killing plants directly, slowing growth of plants, inhibiting seed germination, and creating conditions in which plants cannot receive adequate nutrition. Although a single addition of petroleum hydrocarbons does not appear to limit microbial communities in the long term, species richness often decreases. Oil spills and leaks can create changes in the physical and chemical properties of soil that disturb supplies of water, nutrients, and oxygen (Robertson et al. 2007).

Animals can be affected by contacting or ingesting oil, or breathing vapors, which can cause lung, digestive tract, and liver and kidney damage (EPA 1999). Carcasses can attract predators such as bears, coyotes, and foxes to spill sites. Ingested toxins can be transferred through the blood to offspring through the placenta or milk (Burns et al. 2014). Birds can ingest oil during preening or feeding on contaminated prey, which can lead to weight loss, hemolytic anemia, kidney damage, liver damage, foot problems, gut damage, and immunosuppression (Troisi et al. 2006). Eagles and other raptors may become contaminated by feeding on oiled carcasses, and shorebirds are vulnerable to spills that reach water because they spend much of their time foraging in shoreline habitat (Henkel et al. 2012). Nesting birds that get oil on their legs and chest can transfer oil to eggs during incubation, which can suffocate the egg or lead to developmental abnormalities and reduced survival (Burns et al. 2014).



Spill response and cleanup activities could result in cumulative impacts on wildlife and wildlife habitats. In situ burning to remove spilled oil could result in residue in the location of the burn. Cleanup operations make every effort to decrease the likelihood that wildlife will come in contact with oil, but these activities could temporarily disturb and displace some wildlife. The extent of disturbance depends on the degree of oiling that occurs, the location, and environmental factors.

## **2. Mitigation Measures and Other Regulatory Protections**

Oil and gas activities could potentially have cumulative effects on terrestrial habitats and wildlife populations. Mitigation measures included in this best interest finding address avoidance of habitat loss; protection of terrestrial and wetland habitats; prohibitions and restrictions on surface entry into critical habitat areas, as well as restrictions on other important habitat areas; disturbance avoidance; and free passage and movement of wildlife. Other measures and regulatory protections address seismic surveys, siting of facilities, pipelines, drilling waste, oil spill prevention and control, and rehabilitation. A complete listing of mitigation measures can be found in Chapter Nine. Chapter Seven also provides information on requirements for solid waste and wastewater disposal in the License Area.

## **3. Potential Cumulative Effects on Freshwater Habitats and Fish Populations**

Linear features constructed for oil and gas exploration, development, and production, such as roads, seismic lines, and pipelines could cross lakes, rivers, and streams in the License Area. Oil and gas activities may affect freshwater habitats and fish through increased sediment transport, pressure impacts from the use of explosives, water withdrawal, blockage of stream flow and fish passage, removal of riparian vegetation, changes in water temperature, increased access and fisheries exploitation, and contaminant spills. Impacts can be direct through physical or chemical damage to fish or eggs, or indirect through habitat loss and degradation (Cott et al. 2015).

The License Area is primarily coastal estuarine and marine waters, as discussed below. Most freshwaters in and adjacent to the License Area support anadromous and resident fishes and contain spawning, rearing, overwintering, and migration habitat. The greatest potential for cumulative effects for freshwaters from oil and gas production in the License Area could occur outside of the License Area, if oil is transported by pipeline to connect to TAPS. Waters within and adjacent to the License Area provide salmon, trout, and other fish that support subsistence, commercial, and sport fisheries, as discussed in Chapter Four and Chapter Five.

### **a. Seismic Surveys**

Potential effects from seismic surveys could occur through direct impacts to fish and eggs or embryos, or through habitat degradation at stream crossings. Bank and riparian vegetation damage are more likely to result in cumulative effects on freshwater habitats by increase input of fine sediment to streams that can smother salmon and trout eggs in redds and reduce primary and secondary productivity that contribute to overall reduced growth and survival of fish.

Fish hearing is primarily through the effects of particle motion in water. Generally, fishes with swim bladders that also allow for sound pressure detection, such as salmon, have lower sound pressure thresholds (55 to 83 decibels [dB] reference level in water [re] 1 micropascal [ $\mu$ Pa]) and respond at higher frequencies (200 hertz [Hz] to 3 kilohertz [kHz]) than fishes such as sharks and rays that have thresholds between 78 and 150 dB re 1 $\mu$ Pa and detect frequencies below 100 Hz to 1 kHz (Carroll et al. 2017).

The acoustic energy from seismic airguns has been found to produce threshold shifts in hearing in some freshwater fish, although hearing was recovered within 24 hours and the ear structures and sensory epithelia showed no damage (Popper et al. 2005; Song et al. 2008). Onshore seismic surveys are generally conducted using vibroseis which imparts lower energy than seismic airgun pulses or explosive charges. An evaluation of potential injury and behavioral effects of vibroseis across fish confined in overwintering habitats on the North Slope found no mortality or serious injury and that behavioral responses were brief and limited to the time of operation of the equipment (Morris and Winters 2005).

Onshore seismic surveys in the License Area could negatively impact sensitive salmon egg and embryos stages, and in-river salmon migration. As discussed in Chapter Four, the License Area overlaps essential fish habitat for all five species of Pacific salmon, but no habitat areas are of particular concern. Adherence to ADF&G best management practices for use of explosives near fish habitats would avoid and minimize impacts of seismic surveys on fish (Timothy 2013). With implementation of best management practices, no long-term cumulative effects on freshwater fish and habitats from seismic surveys are expected.

## **b. Development and Production**

Oil and gas development and production activities may require freshwater use and construction and continued use of support facilities such as roads, production pads, pipelines, tank farms, and distribution terminals. Facility construction may require road construction, site preparation, placement of gravel fill, and impoundment and diversion of surface water. These activities may alter aquatic habitats through water withdrawal, increased erosion, storm water runoff, and altered hydrology.

Potential cumulative effects on water availability for fish and wildlife include water use from lakes, ponds or groundwater wells for construction and maintenance of roads and pads and for dust suppression; for mixing drilling muds; for potable, domestic, and fire suppression water supplies; and for industrial process and cooling water. Potential cumulative effects from oil and gas activities on freshwater habitats may include increased turbidity from construction of roads, pads, and pipelines; increased stream temperatures from removal of riparian vegetation; blockage of fish passage; contamination from discharges of drilling muds, cuttings, and storm water runoff.

Some activities associated with oil and gas exploration and development, such as gravel removal, heavy equipment operations, and siting of support facilities could increase stream sedimentation and erosion, impede fish passage, alter drainage patterns, and have other negative effects on freshwater habitats and fish (Schneider 2002; Cott et al. 2015). Erosion can increase turbidity and deposit fine sediments in aquatic habitats, resulting in decreased primary productivity and reduced food for aquatic insects, freshwater mollusks, and fish (Cott et al. 2015). This can lead to direct

mortality, reduced physiological function, and depressed growth rates and reproduction in aquatic organisms (Henley et al. 2000). Secondary effects of road construction and use could include dust deposition, which may reduce photosynthesis and plant growth for adjacent riparian vegetation.

Winter water withdrawals from lakes and rivers can reduce water quality by lowering dissolved oxygen levels, trap or entrain overwintering fish, and reduce connectivity to adjacent water bodies. Construction of new roads can also facilitate fishing access and the dispersal of invasive aquatic organisms (Cott et al. 2015; Trammell et al. 2015). Surface water use is regulated to prevent damage to fish and their overwintering habitats.

### **c. Discharges, Leaks, and Spills**

While some discharges from well drilling and production are intentional, such as permitted discharges regulated by the APDES or NPDES, others are unintentional, such as gas blowouts, leakages, and spills. Discharges, spills, and leaks from oil and gas activities could affect freshwater habitats and fish populations (ADEC 2018b). Gravity causes oil spilled on land to migrate down through the soil, spreading as it descends. When the spill reaches groundwater, it will form a lens on top of the water and will spread laterally if the spill substance is less dense than water. As it encounters flowing water, soluble components may dissolve and form a plume. If the spill substance is heavier than water, it will displace water and continue migrating until it encounters an impermeable stratum (Abriola 1989).

Oil, fuel, and associated polycyclic aromatic hydrocarbons are toxic to fish and a spill that affects spawning habitats could kill eggs and impair recruitment. Failure of sumps used to store drilling mud or camp greywater can also be harmful if wastes reach fish bearing waters (Cott et al. 2015). Sublethal effects and contamination from spills and leaks can reduce productivity and impact subsistence use of fisheries resources.

The location and timing of a spill can affect fish and freshwater habitats differently. Large inland spills, or marine spills moved upstream by tides and wind, could affect anadromous streams, such as the Bering, Campbell, or Edwardes rivers. This type of spill could have varying effects on freshwater fish depending on concentrations of eggs, rearing and migrating juveniles, spawning and migrating adult salmon, and timing of the spill in relation to fish use. Spills into lakes and wetlands may have longer lasting effects than a spill into a large stream or river that is quickly diluted and dispersed. Spills occurring farther upstream in a watershed also place more freshwater habitat at risk than those that occur in lower reaches or along the coast where the contaminants are more readily diluted with the higher volumes of water. Oil spills along or near the coast would be affected by currents, winds, and tides. Coastal spills could be moved up rivers by tides with reoiling of the area with each returning tide.

## **4. Mitigation Measures and Other Regulatory Protections**

Oil and gas activities could potentially have cumulative effects on freshwater habitats and fish and wildlife populations. Mitigation measures included in this best interest finding address avoidance of habitat loss; protection of wetland, riparian, and aquatic habitats; prohibitions and restrictions on surface entry into critical habitat areas, as well as restrictions on other important habitat areas; disturbance avoidance; and free passage and movement of fish and wildlife. Other measures and

regulatory protections address seismic surveys, siting of facilities, pipelines, drilling waste, oil spill prevention and control, and rehabilitation.

Oil and gas development and production are most likely to contribute to cumulative effects on freshwater habitats and fish through construction and operation of an export pipeline. Mitigation measures in this best interest finding, along with regulations imposed by state, federal, and local agencies are expected to avoid, minimize, and mitigate potential effects to freshwater habitats and fish populations. AS 16.05 requires protection of documented anadromous streams from disturbances associated with development. New facilities are required to be located away from lakes and rivers and stream crossing must be designed and maintained to allow fish passage. Any water intake structures in fish bearing waters will be designed, operated, and maintained to prevent fish entrapment, entrainment, or injury. All water withdrawal equipment must be equipped and must use fish screening devices approved by the ADF&G and withdrawal volumes are regulated to prevent damage to fish wintering habitats. Discharge of drilling muds and cuttings to freshwaters or wetlands is prohibited. Disposal of wastewater into water bodies is prohibited unless authorized by an APDES permit. Best management practices and mitigation including: perpendicular crossing of waterways by roads and pipelines, appropriately sized culverts and bridges, and siting permanent infrastructure at least ½ mile from fish-bearing waterways minimizes the potential for cumulative effects of oil and gas activities in the License Area.

A complete listing of mitigation measures can be found in Chapter Nine. Chapter Seven also provides information on requirements for solid waste and wastewater disposal in the License Area.

## **E. Reasonably Foreseeable Cumulative Effects on Coastal and Marine Habitats and Fish and Wildlife Populations**

Post-disposal activities that could potentially have cumulative effects on coastal and marine habitats and fish and wildlife within the License Area include seismic surveys, discharges from well drilling and production, construction and operation of coastal support facilities, and ongoing disturbance from vessel and aircraft traffic. Loud sounds generated by seismic surveys, construction activities such a pile driving, and vessels are a concern for fish, marine mammals, and other marine life. Discharge of drilling fluids, cuttings, and wastewater; and transport of nuisance aquatic organisms from vessel bilge, hull, and cooling water systems from other geographic regions can also degrade coastal and marine habitats (NPC 2011; Limpinsel et al. 2017). Minimizing and mitigating harmful impacts from oil spills requires that spill response equipment and trained personnel are available and can be deployed rapidly.

Gas blowouts and oil spills could potentially occur during exploration, development, and production. An oil spill affecting coastal migration staging and molting areas could expose millions of birds to harm, and reproductive success in coastal seabirds can be reduced for up to 10 years after a spill event (Barros et al. 2014). Effects on fish and wildlife from oil spills in the marine environment include the deaths of seabirds, waterfowl, marine mammals, fish, and marine invertebrates, with potential for widespread and population level effects depending on the size and location of the spill.

## **1. Potential Cumulative Effects on Coastal and Marine Habitats**

Habitats on the ocean floor and along the shoreline may be disturbed by oil and gas activities. Some of these activities may include seismic surveys; construction of docks and loading facilities with associated dredging; placement and operation of pipelines; ship and barge anchoring; and sediments and drilling fluids from discharges. These activities have the potential to result in destruction of the organisms living there.

Coastal and marine habitats within the License Area are essential fish habitat for estuarine juvenile, marine immature, and maturing adult life stages for chum, pink, coho, sockeye, and Chinook salmon; multiple stages of Gulf of Alaska groundfish; and weathervane scallops (NOAA Fisheries 2020a; ADF&G 2018f). The License Area also includes a portion of the Copper River Delta Critical Habitat Area and designated critical habitat for western DPS Steller sea lions, which are federally protected under the Endangered Species Act.

### **a. Seismic Surveys**

Offshore seismic surveys can directly affect tide flats, benthic habitats, and invertebrates through disturbance when cables are placed directly on sediments and shot holes are dug in tidal flats. Immobile invertebrates and seaweeds at these locations could be damaged or destroyed, but generally effects would be temporary and localized. Invertebrates living in or on tidal flats and benthos may also be affected by the particle motion produced by seismic pulses (Carroll et al. 2017). Disturbances to sediment such as trenches and shot holes would be quickly filled through tidal mixing and wave action on substrates. There is a possibility that some larval and adult invertebrates such as scallops, clams, and crabs could be destroyed, damaged, or show behavioral responses to the particle motion produced by seismic pulses. None of the reviewed studies, however, have identified cumulative population level effects on catch rates or abundance (Carroll et al. 2017).

A high-mortality razor clam event on the east side of Cook Inlet in 2010 resulted from pounding waves during a fall storm that dislodged clams and left a large number of dead clams on the beach (Kerkvliet and Booz 2016; Kerkvliet et al. 2018). Vibrations from seismic survey explosions may liquefy sediments and have a similar effect of dislodging clams from the substrate. Seismic activity could also compact beach sand and reduce available habitat for clams and other invertebrates.

### **b. Development and Production**

Oil and gas development and production may include the construction and eventual decommissioning and removal of facilities. These activities can potentially alter offshore and coastal habitats. Vessel anchoring, pipeline laying, dredging, and pipeline burial can temporarily or permanently change bottom habitat by altering substrates used by invertebrates and fish for feeding or shelter. Vessel wakes can increase shoreline erosion, affect wetland habitat, and increase water turbidity. Propeller wash can damage aquatic vegetation and disturb sediments, which can increase turbidity and resuspend contaminants (Limpinsel et al. 2017). The associated epifaunal communities, which may provide feeding or predator escape habitats, may also be removed. Dredging, trenching, and pipe laying generate spoils that when disposed of in the marine environment may smother benthic organisms. Benthic organisms may avoid recolonizing disturbed

areas where the substrate composition has changed or where facilities remain. (Limpinsel et al. 2017).

Pile-driving effects on marine invertebrates would be similar to seismic pulse effects and would be minor due to the low potential for cumulative population level effects (Carroll et al. 2017). Drill rigs and other types of equipment transported to the License Area could potentially contain invasive marine plants and animals that could degrade coastal marine habitats.

### **c. Discharges, Leaks, and Spills**

The state issues permits for the discharge of drilling muds, cuttings, produced water, and stormwater within state waters to ensure the activities meet Alaska's water quality standards. Potential discharges from oil and gas activities include: well drilling fluids, produced water, surface runoff and deck drainage, domestic waste water generated from offshore facilities, vessel bilge and cooling waters, solid waste from wells (drilling muds and cuttings), and other trash and debris associated with oil and gas facilities (Limpinsel et al. 2017).

Discharge of drilling muds and rock cuttings may change the seafloor and suspend fine-grained particles in the water column (IOGP 2016). These changes can affect bottom-dwelling organisms by covering immobile forms or by displacing mobile forms. Fine-grained suspended particulates can reduce light penetration and reduce primary productivity by lowering the rate of photosynthesis (Limpinsel et al. 2017). In addition, these discharges may contain contaminants that can be toxic in high concentrations to aquatic organisms, although toxic ingredients in modern water-based drilling fluids have been removed and replaced with non-toxic additives (IOGP 2016). The effects of water-based mud and cuttings that accumulate on the sea floor include smothering benthic organisms within about 80 feet of the discharge and affecting species diversity up to about 300 feet, though these effects were temporary. The accumulated cuttings can also diminish the diversity of fauna, which in turn can then be dominated by opportunistic species. Faunal diversity may be similar to the surrounding area further from the platform, but the species composition can change. These changes have been detected up to about 20,000 feet from a drilling platform (Grant and Briggs 2002).

Crude oils are classed from light crude to heavy oils, based on specific gravity and viscosity, and each one behaves differently in water. With low viscosity oils (thin oils) breaking waves tend to disperse and break down the contaminant quickly. The dispersed oil mixes in increasing volumes of sea water, which reduces its concentration. The increased surface area promotes biodegradation, dissolution, and sedimentation, and the speed at which the oil spreads depends on its viscosity. Heavier crudes or oils with high viscosity, persist longer in the environment than lighter crudes (Wiens 2013).

ShoreZone's Oil Residency Index (ORI) ranks the sensitivity of beaches to oil spills on a scale of 1 to 5. The ORI shows that spilled oil would persist for days to years on the License Area shorelines, which are ranked primarily 3 (65 percent) and 5 (33 percent) on its scale, where the higher the rating numbers, the more vulnerable the area is to long-term persistence of spilled oil. Similarly, the barrier islands of the Copper River delta rate primarily 2 (22 percent); 3 (46 percent); and 5 (30 percent) on the ORI scale. Sections of the Egg Islands, which are barrier islands west of the Copper River delta and east of Hinchinbrook Island, have a 5 rating, which is the most sensitive

and where oil would persist for months to years. Other sections of these islands have a 2 rating. Oil could move into Orca Inlet and to Hawkins Island, with its more sheltered beaches and higher sensitivities to the persistence of oil further up the inlet (NOAA Fisheries 2020b).

**Table 8.1. Oil Residency for shorelines within the License Area**

<b>Oil Residency Index</b>	<b>Description</b>	<b>Total Length (meters)</b>	<b>Proportion of Length (%)</b>
1	Short persistence; days to weeks	593	0%
2	Short persistence; weeks to months	652	1%
3	Moderate persistence; weeks to months	79,407	65%
4	Moderate persistence; months to years	726	1%
5	Long persistence; months to years	40,484	33%
<b>Total</b>		<b>121,863</b>	<b>100%</b>

Source: (NOAA Fisheries 2020b)

Oil may also move through the Hinchinbrook Entrance into Prince William Sound. Coastal ocean currents enter Prince William Sound from the east and flow out through the west, causing an exchange of water every three to four weeks (Gilfillan et al. 2001). Much of the mainland on Orca Inlet across from Hawkins Island, 65 percent, has a 5 rating (NOAA Fisheries 2020b).

## 2. Mitigation Measures and Other Regulatory Protections

Oil and gas activities could potentially have cumulative effects on coastal and marine habitats. Cumulative effects are most likely to include some direct habitat loss and degradation from facilities, construction, and mobilization activities.

AS 16.05 requires protection of documented anadromous streams from disturbances associated with development. All water withdrawal equipment must be equipped with and use fish screening devices approved by the ADF&G. Discharge of drilling mud, cuttings, produced water, and wastewater is prohibited unless authorized by an APDES permit. Mitigation measures identified in Chapter Nine clarify that discharge of drilling muds and cuttings to lakes, streams, rivers, or wetlands is prohibited and that the preferred method for disposal of muds and cuttings is by underground injection. Because mitigation measures in the License Area prohibit offshore drilling, the marine habitat would be minimally affected by permitted discharges of produced water, drilling muds, or rock cuttings. Additionally, subsea pipelines seaward of the mean highwater line would be prohibited in the License Area.

As discussed above, the License Area may have an increased risk of coastal oil spills due to seasonal restrictions, weather, wave heights. Spill response times would likely be slow given the remoteness of the License Area and stretches of sensitive shorelines could be affected for months to years. Because of this underlying factor, the potential cumulative effects of oil spills on marine and anadromous fish are enhanced.

Mitigation measures also address disturbance avoidance, particularly in critical habitat areas; seismic activities; offshore infrastructure and drilling restrictions; siting of facilities; pipelines; oil spill prevention and control; and discharges and waste from drilling and production. Measures in

this best interest finding, along with regulations imposed by state, federal and local agencies, are expected to avoid, minimize, and mitigate potential effects. Risk of oil spills, spill avoidance, and spill response planning are discussed in Chapter Six. A complete listing of mitigation measures and other regulatory protections is found in Chapter Nine.

### **3. Potential Cumulative Effects on Marine and Anadromous Fish Populations**

Oil and gas activities including the construction of new infrastructure, seismic surveys, and discharges into coastal and nearshore waters could have cumulative effects on fish populations. Potential negative effects could include: damage or disturbance from seismic or other loud sounds; uptake or entrainment at water intakes; blockage of coastal movements from support facilities such as marine terminals, docks and piers; and reduced water quality from point and non-point source pollution, increased turbidity, and increased sedimentation. Collectively, these effects could contribute to reduced egg, larval, juvenile, or adult survival of marine and anadromous fishes through behavioral changes, diminished condition, reduced spawning site fidelity, increased susceptibility to pollutants or disease, shifts in fish distribution, and direct mortality.

#### **a. Seismic Surveys**

As discussed above, fish hear through the effects of particle motion in water. Generally, fishes with swim bladders, such as salmon and herring, have lower sound pressure thresholds (55 to 83 dB re 1  $\mu$ Pa) and respond at higher frequencies (200 Hz to 3 kHz) than fishes such as sharks and rays that have thresholds between 78 and 150 dB re 1  $\mu$ Pa and detect frequencies below 100 Hz to 1 kHz (Carroll et al. 2017). Most energy from seismic airguns ranges from 10 to 120 Hz with sound pressures as high as 255 dB re 1  $\mu$ Pa or well above the levels known to cause injury to fish (Halvorsen et al. 2012; Limpinsel et al. 2017). Received sound pressure levels depend on the distance of the fish from the source. Loud sounds may cause fish to change behavior by moving away from the source, display alarm response, change schooling pattern, change swimming speed and location in the water column, and interrupt feeding and reproduction (Limpinsel et al. 2017). In addition, disruptions in fish behavior can contribute to secondary effects including increased stress; displacement to lower value feeding or spawning areas; increased vulnerability to predators; masking of biologically important sounds; and changes in migratory patterns (Popper and Hastings 2009; NOAA 2016; Popper and Hawkins 2019). While standard ramp up procedures for seismic surveys allow for mobile fish to escape the area before any detrimental physical effects occur, fish eggs, fish larvae, and zooplankton would not be able to escape and would be exposed to lethal sound levels within 2 to 10 feet, and injurious sound levels within about 16 feet from the sound source (NOAA 2016). Decreased zooplankton abundance and increased mortality may occur out as far as 0.75 miles from seismic surveys (McCauley et al. 2017)(McCauley, R. D. et al. 2017).

Seismic surveys require permits with mitigation measures and would likely be timed to avoid salmon spawning migration periods when commercial, subsistence, and personal use salmon fisheries are active in the License Area. The total area exposed to sound pressures that could injure or kill fish during seismic surveys would be relatively small and the activity would be short term over periods of days or weeks. Most mobile fish would avoid injury by avoiding ensonified areas and would be expected to return to habitats within hours to days after the survey.



## **b. Development and Production**

Oil and gas activities that generate noise that could affect marine and anadromous fishes include drilling, construction (pile driving), production facility operations, seismic surveys, and vessel operations. Pile-driving sound pressure levels have been shown to cause serious injury to fish that remain in close proximity to the source (Popper and Hastings 2009; Halvorsen et al. 2012). Pile driving, dredging, and vessel sounds may block or delay the migration of anadromous fishes, interrupt or impair communication, or impact foraging behavior (Limpinsel et al. 2017). Fish may habituate to consistent stationary noises associated with drilling and facility operations which would reduce potential effects from displacement (NOAA 2016). Cumulative population level effects of industrial sounds on fish abundance and catch rates are equivocal (Carroll et al. 2017). While pile-driving has been shown to affect the distribution and behavior of juvenile pink and chum salmon, the question of whether these responses affect the fitness of juvenile salmon could not be answered (Feist et al. 1996).

Nearshore oil and gas pipeline installation can affect marine and anadromous fish primarily through habitat loss or alteration that affect shallow-water environments such as estuaries and wetlands. Pipeline burial can alter benthic habitats by changing substrates, creating barriers or escarpments that prevent invertebrates from migration and movement; and cause vegetation loss, soil erosion, submergence, or drainage of saltmarshes that decrease feeding and shelter habitat for commercially important invertebrates and fish. Buried pipeline installation can also resuspend and release contaminants from sediments (Limpinsel et al. 2017).

Docks, piers, and marine oil and gas terminals can block sunlight penetration, alter wave and current energy, introduce chemicals, and restrict access and navigation. The size and composition of docks and piers, and orientation in relation to the sun's angle, can influence the shade footprint from an overwater structure and the extent of the localized shading effect. Shading caused by overwater structures may affect primary production and the distribution of fish and zooplankton. While the impacts of individual overwater structures would be localized and minor, where multiple structures are aggregated within the same area effects would be cumulative (Limpinsel et al. 2017).

## **c. Discharges, Leaks, and Spills**

Discharge of drilling muds, cuttings, vessel bilge and ballast water, and produced water may affect feeding, nursery, and shelter habitat for fish and invertebrates (Limpinsel et al. 2017). As discussed above, these discharges are highly regulated, quickly dispersed in high energy environments, and non-toxic.

Accidental leaks and spills from oil and gas activities may contaminate aquatic habitats within the License Area. Spilled petroleum products may result from activities such as drilling and transportation of personnel and materials. Petroleum products may persist in aquatic environments for years after a spill or leak. Petroleum products in the water column can affect the ability of fish to take up oxygen or otherwise cause harm through ingestion. Oil contaminations can also severely impact egg, larvae, and juvenile survival because they may not have the ability to escape from the contaminated waterbody (Trammell et al. 2015).

Spills in open water are dispersed and spread through weathering and can affect fish, birds, and mammals that may be in the area of the oil spill. Different types of petroleum products disperse and

degrade differently and may have different effects on marine life. Vessel operations pose a risk of accidental spills that can affect water quality, coastal and marine habitats, and marine and anadromous fish populations. Diesel, the most commonly used fuel, is acutely toxic on contact to fish, invertebrates, and plants (Michel et al. 2013). While most adult fish in coastal and marine habitats can usually avoid fuel and oil spills, egg, larvae, and juvenile fish survival may be affected because their limited mobility may not allow them to escape the spill area (Trammell et al. 2015).

Oil spills along or near the coast could disperse and degrade faster due to stronger currents and wind. Alternatively, the oil could recoat the coast with each returning tide. A large spill within the License Area could negatively affect coastal and marine habitats used by marine and anadromous fishes. Oil deposited in river deltas and estuary mouths could directly and indirectly affect habitats for all salmon species and life stages, depending on the location, timing, volume, and type of oil spilled. Coho and sockeye salmon are the most abundant salmon species in the License Area. Pink salmon tend to spawn in lower reaches of freshwater streams; thus, their eggs may be more susceptible to oiling from a marine spill. Although early life stages, particularly eggs, are the most vulnerable to effects from oiling, rearing juvenile salmon and migrating adult salmon and smolts could also experience detrimental direct and indirect effects from oiling. A key finding from the decades of work funded by the Exxon Valdez Oil Spill Trustee Council (EVOSTC) is that there are multiple mechanisms for effects on marine life, including direct toxic effects and subtle indirect effects (Michel et al. 2016).

Acute effects on growth and survival of pink salmon fry were detected in 1989, but by 1990, fry grew comparably in oiled and unoled reference portions of Prince William Sound, suggesting there were no residual effects from lingering oil. Continued sampling, however, found that lingering oil adjacent to streams increased the mortality rate for pink salmon embryos (Michel et al. 2016).

The Deepwater Horizon (DWH) disaster was the largest oil spill yet to occur in the pelagic zone of an oceanic ecosystem. Over four million barrels of crude oil were released into the Gulf of Mexico. Crude oil released at depth eventually rose to warm mixed layers and surface waters of the northern Gulf of Mexico during the spawning windows for bluefin tuna and many other large predator species. These pelagic fish all produce fertilized eggs that float in the upper layers of the water column. It is likely that the early life stages of many northern Gulf pelagic fish were exposed to crude oil. Warm-water pelagic embryos are sensitive to crude oil cardiotoxicity, similar to previous reports for temperate and boreal species. Finfold defects and reduced fin growth appear to be specific effects of crude oil exposure, and not necessarily because of developmental delay in embryos with severe edema. The spatial extent of injury to fish in early life stages may be large, in response to both fresher oil proximal to the wellhead and more weathered oil further away from the release site (Incardona et al. 2014).

Studies have confirmed that DWH oil has affected marsh forage fish. Signs of oil exposure and gill abnormalities were identified in fish taken from oiled sites in 2010. Their laboratory exposures of Gulf killifish embryos to field-collected sediments from Grande Terre and Barataria Bay, Louisiana, also resulted in developmental abnormalities including failure to hatch, lower growth, slower heart rate, and increased yolk sac and pericardial edema when compared with exposure to sediments collected from a reference site (Trustees 2016). Flounder are a key predator in marsh ecosystems. This behavior of fish and mobile invertebrates also exposes them to oil that has been deposited in marsh sediments. The Trustees conducted laboratory studies to evaluate the effect of

oil on juvenile flounder growth over 32 days of exposure. Juvenile flounder of lengths 1.8 to 3.5 centimeters were placed on sediments spiked with weathered oil over a range of concentrations representing those found at oiled marsh sites. Juvenile flounder exposed to oil put on less weight and reached smaller sizes than fish exposed to clean sediment. Gill and liver abnormalities were also observed in juvenile fish exposed to DWH oil contaminated sediments (Trustees 2016).

## **4. Mitigation Measures and Other Regulatory Protections**

Oil and gas activities could potentially have cumulative effects on coastal and marine fish and wildlife populations. Cumulative effects are most likely to include some direct habitat loss and degradation from facilities and disturbance from vessel and air traffic, construction, mobilization activities, and production sounds.

AS 16.05 requires protection of documented anadromous streams from disturbances associated with development. Any water intake structures in fish bearing water bodies will be designed, operated, and maintained to prevent fish entrapment, entrainment, or injury. All water withdrawal equipment must be equipped with and use fish screening devices approved by the ADF&G. Discharge of drilling mud, cuttings, produced water, and wastewater is prohibited unless authorized by an APDES permit. Marine invertebrates, fish, and birds are not expected to be impacted by discharge of non-toxic drilling muds, cuttings, produced waters, and other effluents associated with oil and gas exploration, development, and production because mitigation measures in the License Area prohibit offshore drilling. The License Area minimizes the effects of pipelines on marine and anadromous fish by prohibiting undersea pipelines seaward of the mean highwater line.

As discussed above, the License Area may have an increased risk of coastal oil spills due to seasonal restrictions, weather, wave heights. Spill response times would likely be slow given the remoteness of the License Area and stretches of sensitive shorelines could be affected for months to years. Because of this underlying factor, the potential cumulative effects of oil spills on marine and anadromous fish are enhanced. The License Area will have seasonal restrictions and sound pressure level requirements for seismic activities in or near marine waters, to minimize impacts to fish. When seismic surveys are conducted, ramp-up procedures will be used to allow fish to move away from the source before being fully exposed.

Mitigation measures also address disturbance avoidance, particularly in critical habitat areas; seismic activities; offshore infrastructure and drilling restrictions; siting of facilities; pipelines; oil spill prevention and control; and discharges and waste from drilling and production. Measures in this best interest finding, along with regulations imposed by state, federal and local agencies, are expected to avoid, minimize, and mitigate potential effects. Risk of oil spills, spill avoidance, and spill response planning are discussed in Chapter Six. A complete listing of mitigation measures and other regulatory protections is found in Chapter Nine.

## **5. Potential Cumulative Effects on Coastal and Marine Wildlife Populations**

A primary concern regarding oil and gas development in marine waters is the potential effects that noise from construction activities, drilling, seismic surveys, vessel, and aircraft activities could

have on marine mammals and other coastal and marine animals (Hofman 2003; NAS 2017). Most potentially disturbing oil and gas activities in the License Area would be limited to the period between November 1 and March 31, when many migratory marine mammals and birds are not likely to be present in the License Area. Of specific concern in the License Area are potential cumulative effects of oil and gas development or oil spills on marine mammals that are present year-round in nearshore waters of the License Area – northern sea otters, eastern and western DPS Steller sea lions, harbor seals, eastern North Pacific gray whales, killer whales, Dall’s porpoise, and harbor porpoise; and cumulative effects of spills on waterfowl, seabirds, and shorebirds of conservation concern in the License Area. Below is a discussion of reasonably foreseeable potential cumulative effects from oil and gas activities on coastal and marine wildlife populations in the License Area.

### **a. Seismic Surveys**

The way sound travels through water depends on the depth of the sound source, the bathymetry, and the sea-bed properties. The perceived loudness of a sound depends on the hearing ability and sensitivity of the animal, the level of background noise, and the physical environment through which the noise travels before reaching the animal. Sufficiently loud sounds (sound pressure) can result in temporary or permanent injury to marine mammal hearing (Level A take), while moderate sounds can disrupt marine mammal behavior (Level B take). Current regulatory and mitigation efforts are directed at reducing the risk of injury that can result in permanent threshold shifts and temporary threshold shifts in marine mammal hearing from exposure to high sound pressure levels (Simmonds et al. 2014; NOAA Fisheries 2017; NMFS 2018).

National Marine Fisheries Service (NMFS) recently issued a marine mammal Incidental Harassment Authorization for Lamont-Doherty Earth Observatory of Columbia University and National Science Foundation (NSF) geophysical (seismic) surveys that extended over nearshore, shelf, and oceanic waters in the Gulf of Alaska. The 18-day survey in June 2019 used a 36-airgun array to conduct a two-dimensional seismic survey along the Alaska Peninsula subduction zone. Exclusion zones for Level A – injurious takes, and Level B – harassment takes were established and monitored for low-, mid-, and high-frequency hearing whales; as well as seals and sea lions. NMFS concluded that impacts resulting from this activity were not expected to adversely affect the marine mammals; mortality was not anticipated or authorized; areas of similar habitat value were available, so animals could temporarily leave the survey area and avoid exposure to sound; and potential adverse effects on prey animals would be localized and temporary (NMFS 2019a, b).

While monitoring may underestimate the actual number of animals exposed to injurious or harassing sound levels, animals observed within the Level A and Level B exposure radii were 1.0 percent and 0.2 percent of the authorized takes, respectively. No distinctive behavioral reactions to either the vessel or source were noted, and six source shut downs were conducted in response to marine mammals observed within the protection radii. Of marine mammals listed for the License Area, Level A takes included 6 Dall’s porpoises that approached the vessel. Level B takes included 1 fur seal, 2 unknown pinnipeds, 22 fin whales, 1 humpback whale, 10 killer whales, and 33 unknown whales (Dubuque et al. 2019; NMFS 2019b).

An environmental assessment for the survey summarized documented effects of seismic surveys on marine mammals in the Gulf of Alaska survey area. The effects of sounds from airguns generally

include: tolerance, masking of natural sounds, behavioral disturbance, and temporary or permanent hearing impairment, or non-auditory physical or physiological effects. Behavioral responses can include movement away from the source that reduces the overall exposure to that sound. Marine mammals that encounter a survey in progress could experience localized and short-term behavioral disturbance. Several studies have shown that marine mammals at distances more than a few miles from operating seismic vessels often show no response, even when the pulsed sounds should be audible to the animals. Some baleen and toothed whales, and (less frequently) pinnipeds, have been shown to react behaviorally to airgun pulses, while at other times mammals these groups have shown no overt reactions (Ireland et al. 2019).

Masking effects of pulsed sounds from arrays of airguns on marine mammal calls and other natural sounds are expected to be limited, because of the intermittent nature of seismic pulses. Animals can emit and receive sounds between pulses and some cetaceans are known to change their calling rates, shift their peak frequencies, or otherwise modify their vocal behavior in response to airgun sounds. Sounds important to small toothed whales are predominantly at much higher frequencies than airgun sounds, limiting the potential for masking. In general, masking effects of seismic pulses are expected to be minor, given the normally intermittent nature of seismic pulses (Ireland et al. 2019).

Disturbance includes a variety of effects, including subtle to conspicuous changes in behavior, movement, and displacement. Marine mammals react briefly to an underwater sound by changing its behavior or moving a small distance. Impacts of behavioral changes are unlikely to be significant to the individual, unless the sound source displaces marine mammals from important feeding or breeding areas over a prolonged period. Studies have attempted to model consequences of underwater noise at population levels using sound criteria to estimate how many marine mammals could be disturbed by a seismic program based primarily on behavioral observations of a few species (Ireland et al. 2019).

Baleen whales generally tend to avoid operating airguns, often reacting to strong pulses by deviating from their normal migration route and/or interrupting their feeding and moving away. In the cases of migrating gray whales, the observed changes in behavior appeared to be of little or no biological consequence. Gray whales exposed to seismic survey sound levels up to ~170 dB re 1  $\mu$ Pa did not appear to be strongly disturbed, although a few whales were observed moving away from the airguns. Dolphins and other small toothed whales regularly occur near operating airgun arrays, but in general show some avoidance of operating seismic vessels. Most studies of sperm whales exposed to airgun sounds show considerable tolerance and, in most cases, no strong avoidance. Limited data suggest that harbor porpoises may show stronger avoidance of operating seismic vessels than Dall's porpoises, consistent with their responsiveness to boat traffic and other acoustic sources, although animals returned within a few hours. Pinnipeds are likely to show only slight avoidance and changes in behavior (Ireland et al. 2019).

Coastal birds may be displaced by noise and disturbance from seismic surveys. The disturbances may impact migration staging, molting, and foraging habitats. Molting waterfowl are particularly vulnerable to disturbance as they cannot fly, and during migration waterfowl and shorebirds have limited amounts of time to gain resources at staging areas to fuel migration (Lacroix et al. 2003; Gill and Tibbitts 1999; Colwell 2010; Powell et al. 2010; Taylor et al. 2010). Disturbance and displacement during these periods can reduce survival and productivity. Seismic surveys, while

introducing intense sound, are a transient disturbance lasting usually only hours to days at specific locations. A study of nearshore seismic surveys evaluated potential effects on molting long-tailed ducks and concluded that seismic surveys did not alter distribution or diving behavior (Lacroix et al. 2003). Reduced productivity of intertidal invertebrates, an important food for migratory waterfowl and shorebirds, from seismic surveys could reduce prey availability, leading to impacts on migratory waterfowl and shorebirds (ADF&G 1988, 1994). Because exploration activity in the License Area is limited to between November 1 and March 31, most disturbance to migrating shorebirds and waterfowl, molting waterfowl, and breeding seabirds in the License Area would be avoided.

## **b. Development and Production**

Oil and gas development and production activities can affect coastal and marine wildlife through habitat loss, disturbance that results in displacement, collision mortality with vessels or infrastructure, and reduced survival and productivity from cumulative disturbances. Of these potential effects, the cumulative effects of stress from exposure to anthropogenic sounds has been identified as a primary concern for determining the welfare of marine mammal populations (NAS 2017). Anthropogenic sounds can mask marine mammal sounds critical for feeding. Anthropogenic sounds can also affect reproduction. Cumulative effects, from multiple stressors that are more difficult to determine, have received less management attention (Simmonds et al. 2014; NAS 2017).

Recent efforts in Cook Inlet have attempted to evaluate exposure to multiple sound sources on Cook Inlet beluga whales (*Delphinapterus leucas*) and found some sources had the potential to mask beluga communications. Sources of anthropogenic noise in Cook Inlet identified from acoustic recorders included: commercial ship, dredging, helicopter, jet aircraft, fighter jet, propeller aircraft, outboard motor, pile driving, sub-bottom profiler and four repetitive unidentified noise sources (Castellote et al. 2019).

Potential effects from exposure to sound pressure levels generated during pile driving have similar effects as seismic exploration discussed above. While individual projects would be localized, they have the potential for cumulative effects in combination with other oil and gas and non-oil and gas-related projects. Construction noise is generally more intense than production noise since more vessels and equipment would generally be in use. Continuous sounds during drilling from the Spartan 151 jack-up rig, in Cook Inlet, did not exceed levels considered to harass marine mammals; impulse sounds exceeding 120 dB re 1 $\mu$ Pa, considered to result in non-injurious harassment, were measured within 1.2 to 1.4 km from the rig (Marine Acoustics 2011).

Propulsion noise from shipping has increased ocean sound levels within the 25 to 50 Hz band by 8 to 10 dB between the mid-1960s to the mid-1990s and has remained constant or decreased slightly from the mid-1990s to the mid-2000s (NAS 2017). Collisions with ships are a threat to large whales and even when not lethal, collisions with a vessel causes stress and injury (NAS 2017). A total of 34 vessel strikes of large whales were documented in Alaska waters during the 5-year period from 2013 to 2017: 29 humpback whales, 2 fin whales, 1 sperm whale, and 2 unknown whales. Vessel strikes were also recorded for one killer whale and one Steller sea lion during this period (Delean et al. 2020). Operators in the License Area would use vessels and aircraft for crew exchange, delivery of equipment and supplies, and shipping of products. As a result, oil and gas development and production in the license Area could increase ocean sound levels and marine mammal collisions.

Seabirds and waterfowl can collide with vessels, coastal buildings and towers, and offshore platforms, especially during poor weather conditions (Ronconi et al. 2015; Kuletz and Labunski 2017). Exploration, transportation and support vessel traffic, and production noise could disturb seabirds and waterfowl from important habitat areas, potentially displacing them into lower quality habitats leading to reduced survival or reproduction potential (Larned 2006). Awareness and avoidance of seasonal concentration areas for waterfowl and seabirds would minimize potential impacts (Kuletz and Labunski 2017). Molting waterfowl are particularly vulnerable to disturbance because they cannot fly (Lacroix et al. 2003), and during migration staging waterfowl and shorebirds have limited amounts of time to gain resources at staging areas to fuel migration. Disturbance and displacement during these periods can reduce survival and productivity (Gill and Tibbitts 1999; Powell et al. 2010; Taylor et al. 2010).

Disturbances from construction, maintenance, and operation of oil and gas infrastructure, as well as general increased activity in the area, has the potential to impact migratory birds. One study found that of the total shorebirds migrating through the Copper River delta (an estimated 5.32 million), 23.7 percent, or an estimated 1.25 million shorebirds, use the Controller Bay area, which is likely the first mudflat encountered during spring migrations (Bishop and Green 1994). A recent study of radio-tagged red knots showed that Controller Bay is an important stopover for this species during spring migration. Red knots feed on bivalves in coastal mudflats, which are likely available as a food source for shorebirds in Controller Bay (Bishop et al. 2016). Staging shorebirds rely on nutrients and energy consumed during spring migration to ensure successful nesting once they reach breeding grounds throughout the state. Tidal mudflats, such as those found in the Bering River delta, provide essential feeding areas for migratory birds (Bishop et al. 2016; Senner 1979; Powers et al. 2002). The potential for disturbance of migrating shorebirds and waterfowl would be reduced in the License Area, because most oil and gas activities would occur between November 1 and March 31.

### **c. Discharges, Leaks, and Spills**

Discharges, leaks, and spills could affect marine mammals and birds in and outside of the License Area. A large spill within the License Area could negatively affect coastal and marine wildlife. Oil spills can affect marine mammals and birds through inhalation, ingestion, direct contact, and absorption. Coastal or marine spills in areas that are heavily used by large numbers of marine mammals or coastal birds could have significant population-level impacts. In the License Area, heavy-use areas include the Bering, Campbell, and Edwardes river deltas in Controller Bay during salmon runs; in coastal molting areas during late-summer and fall; or on mudflats and coastal areas used by migrating waterfowl or shorebirds in spring and fall. Smaller discharges of drilling muds, cuttings, and produced water are non-toxic and regulated and are not likely to contribute to cumulative effects on marine mammals or other coastal wildlife.

In March 1989, the Exxon Valdez ran aground on Bligh Reef at the mouth of Valdez Arm in Prince William Sound and spilled over 11 million gallons of crude oil into the water. Approximately 40 percent of the spilled oil impacted beaches and shorelines in Prince William Sound. Following the spill many studies indicated that significant fish and wildlife populations were exposed to the spilled oil. The exact number of fish and wildlife killed as a result of the spill is not known (EVOSTC 2017); however, an estimated 500 to 5,000 northern sea otters and 100,000 to 300,000 seabirds were likely killed due to oil exposure (Garrott et al. 1993; Piatt et al. 1990). Carcass

sampling and exposure probability models estimated 600,000 and 800,000 bird mortalities from the Deepwater Horizon oil spill in the Gulf of Mexico with most mortality affecting: laughing gulls *Leucophaeus atricilla* (32 percent of the northern Gulf of Mexico population killed), royal terns *Thalasseus maximus* (15 percent), northern gannets *Morus bassanus* (8 percent), and brown pelicans *Pelecanus occidentalis* (12 percent) (Haney et al. 2014).

Cormorant populations in Prince William Sound have recovered from lows caused by environmental regime shifts and by the Exxon-Valdez oil spill (EVOSTC 2017). Overall density for cormorants in oiled areas of Prince William Sound increased significantly between 1989 and 2007 (McKnight et al. 2008). Of the 12 bird species monitored in the Exxon Valdez oil spill area over a 25-year period since the spill, eight have recovered, one has very likely recovered, two are not recovering, and one has an unknown recovery status. (EVOSTC 2014).

Harlequin ducks spend most of their time in intertidal and shallow subtidal habitats where much of the oil was initially stranded. It was estimated that 1,000 harlequins were killed by the initial oiling event, which represented about 7 percent of the wintering population. In addition to acute effects, harlequin ducks were one of the few species for which chronic injury related to long-term exposure to lingering oil was documented. Several post-spill studies were designed to measure the extent and severity of injuries to Prince William Sound harlequin ducks. Through 1998, oil spill effects were still evident. No difference in population trends was observed between oiled and non-oiled areas in studies conducted between 1997 and 2007. However, lingering oil appeared to remain in habitats used by harlequins, thereby maintaining the possibility of chronic effects related to continued exposure. As of 2013, harlequin ducks were considered recovered (EVOSTC 2014).

Following the Exxon Valdez oil spill, it was estimated that about 250 eagles (about 5 percent of the Prince William Sound population) died as a result of the spill but estimates of mortality for other areas affected by the spill were less certain. Productivity was reduced in oiled areas of Prince William Sound in 1989, and only 30 percent of occupied nests produced young. Production apparently returned to normal in 1990 and 1991. It seems that the bald eagle population in the spill area was able to withstand the injury it sustained from the spill with no apparent long-term issues. Its resiliency, relative to other species, can be attributed to the fact that the population was healthy and increasing when the spill occurred (Bowman 1999). Sea lions and other animals that haul-out or spend time on shore are more likely to encounter and suffer from the effects of oil. Whales, dolphins and other cetaceans may be at risk from floating oil when surfacing to breathe or breach, but where there have been mortalities near oil spills, necropsies have shown the cause of death was not related to oil (ITOPF 2014). Sea otters are especially vulnerable to impacts from oiling. They do not have blubber, and because oil destroys the insulating properties of their fur, they are extremely susceptible to hypothermia (Helm et al. 2015).

Direct contamination of shorebirds is also a concern, as is direct or indirect contamination and elimination of benthic food supplies. Oil deposited in mud flats, river deltas, and estuaries would have the greatest potential for direct and indirect effects on migrant shorebirds as these areas are used extensively for foraging during migration staging (Gill and Tibbitts 1999). Oil spills as well as low-level exposure to toxins could have deleterious effects on resident and overwintering populations of rock sandpipers (Stenhouse and Senner 2005; Warnock 2017). A key finding from the decades of work funded by the Exxon Valdez Oil Spill Trustee Council is that there are multiple



mechanisms for effects on marine life, including direct toxic effects and subtle indirect effects (Michel et al. 2016).

## **6. Mitigation Measures and Other Regulatory Protections**

Oil and gas activities could potentially have cumulative effects on marine wildlife populations. Cumulative effects are most likely to include some direct habitat loss and degradation from facilities and disturbance from vessel and air traffic, construction, mobilization activities, and production sounds.

Discharge of drilling mud, cuttings, produced water, and wastewater is prohibited unless authorized by an APDES permit. Marine wildlife are not expected to be impacted by discharge of non-toxic drilling muds, cuttings, produced waters, and other effluents associated with oil and gas exploration, development, and production because mitigation measures in the License Area prohibit offshore drilling. As a result of the Exxon Valdez Oil Spill, the Oil Pollution Act of 1990 was enacted and safety protocols for transporting oil have changed the way industry conducts business. Safety and environmental compliance are now considered to be of paramount importance at oil and gas facilities around the world.

Mitigation measures also address disturbance avoidance, particularly in critical habitat areas; seismic activities; offshore infrastructure and drilling restrictions; siting of facilities; pipelines; oil spill prevention and control; and discharges and waste from drilling and production. Measures in this best interest finding, along with regulations imposed by state, federal and local agencies, are expected to avoid, minimize, and mitigate potential effects. Risk of oil spills, spill avoidance, and spill response planning are discussed in Chapter Six. A complete listing of mitigation measures and other regulatory protections is found in Chapter Nine.

## **F. Reasonably Foreseeable Cumulative Effects on Fish and Wildlife Uses**

As described in Chapter Five, fish and wildlife populations in the License Area support subsistence, commercial, and sport fishing, hunting, and trapping, as well as non-consumptive recreation and tourism use. Consumptive and non-consumptive uses both depend on healthy habitats and fish and wildlife populations, which can experience cumulative effects from oil and gas activities as described above. Additional potential effects on consumptive uses are discussed in the following sections.

Potential oil and gas activities that could have cumulative effects on fish and wildlife uses within the License Area include seismic surveys, construction of support facilities, discharges from well drilling and production, and ongoing disturbances from production activities such as vehicle, vessel, and aircraft traffic. In addition, oil spills could potentially occur during exploration, development, and production.

## 1. Potential Cumulative Effects on Subsistence

The communities near the License Area and in Prince William Sound use a wide variety of wild resources, including salmon and other fish, large terrestrial mammals, small terrestrial mammals, migratory waterfowl and upland game birds, marine mammals, marine invertebrates and wild plants and berries (ADF&G 2018a, b, c, d, e). The highest priority use related to cumulative impact from construction of support facilities for onshore oil and gas development is related to changes in access for subsistence uses. During oil and gas exploration, seismic surveys could displace game animals from hunting and trapping areas, limiting their availability for harvest. During oil and gas development and production, oil field roads may be unavailable for access for subsistence uses with potentially cumulative effects on hunting, fishing, and gathering access (USFWS 2016). Alternatively, when access is allowed for subsistence, users' perceptions of possible contamination or unwillingness to hunt, fish, or gather near developments may result in long-term changes to subsistence-use areas.

A major oil spill could temporarily decrease resource availability and accessibility and create or increase concerns about food safety which could result in significant effects on subsistence users, which could linger for decades or longer (Jones and Kostick 2016). Subsistence harvests of fish and wildlife by residents of 15 predominately Alaska Native communities, as well as by residents in larger rural communities, declined by as much as 77 percent after the 1989 *Exxon Valdez* oil spill (EVOSTC 2014). Subsistence use in Tatitlek and Chenega Bay, two villages in Prince William Sound, decreased 56 percent following the *Exxon-Valdez* oil spill in 1989-1990. Most affected resources were marine invertebrates, marine mammals, and birds. Traditional patterns of sharing were consequently disrupted (Fall 1999).

The main reason that subsistence harvest declined so dramatically was fear that oil had contaminated the resources and made them unfit to eat. By 2006, most users considered seals, finfish, and chitons safe for consumption, but expressed concerns over the safety of clams. Additional complex factors may confound effects of an oil spill, including demographic changes in communities, ocean warming, increased competition for fish and wildlife resources by other user groups, predators, and increased awareness about paralytic shellfish poisoning and other contaminants (EVOSTC 2014). Fears about food safety have diminished since the spill, although some respondents expressed concerns about the safety of herring and clams, and harvest levels from villages in the spill area are comparable to other Alaskan communities (EVOSTC 2014; Jones and Kostick 2016; Michel et al. 2016). Spill and leak prevention and response are addressed in Chapter Six, and Chapter Nine includes mitigation measures that will prevent spills and minimize the impacts from any releases that may occur.

## 2. Potential Cumulative Effects on Commercial and Sport Fishing, Hunting and Trapping

Cumulative effects from construction of support facilities for onshore oil and gas development include changes in public access, impacts to habitats, and abundance and distribution of fish and wildlife populations. Seismic surveys could displace game animals from hunting and trapping areas, limiting their availability for harvest. During oil and gas development and production, the public use of oil field roads may be prohibited, excluding public access to public lands with

potentially cumulative effects on hunting and fishing access. But when oil field roads are open to public use, they could increase public access to hunting, trapping, and fishing areas. The roads could also reduce costs for subsistence activities, increase harvest efficiency, and increase competition between user groups for fish and wildlife resources (USFWS 2016).

Oil and gas terminals and docks and associated vessel traffic can interfere with setnet fisheries through reducing the area available for fishing and potentially displacing migrating salmon further offshore beyond the reach of the setnets. A 2004 study in Cook Inlet found that oil and gas infrastructure did not create a subsurface obstruction hazard for fishing gear because most infrastructure is too deep to be within the range of that gear. Platforms were considered a navigational safety issue, although reports of actual interactions with gillnet operations were rare. Temporary structures such as jack-up rigs were found to pose more of a hazard for fishers than permanent platforms because their locations were less predictable (Pettersen and Glazier 2004).

While the Cook Inlet study showed that areas with infrastructure in shallower water were generally avoided by gillnet fishers to prevent grounding, conditions are different in the License Area. The commercial drift gillnet fisheries in the License Area primarily target sockeye and coho salmon near shore and in shallow water. Access to the areas being fished is not direct, often requiring travel over shallow sand bars and within specific defined channels to access fishing sites. The nearshore waters in the License Area are used heavily by the commercial drift gillnet fleet and blockage or rerouting for oil and gas equipment could alter the fleet's ability to access and harvest fishery resources.

Fishing areas may be closed due to the presence of oil, and fisheries products may be considered tainted and unacceptable to the consumer. The Copper River and Bering River district fisheries are low volume but high value fisheries. The Bering River District salmon harvest had an average annual value of about \$900,000 during 2015 to 2017, which represents roughly 5 percent of the Copper River District harvest. Perception of oil-tainted fish would have far reaching consequences for the sale and marketing of these high value salmon with a market built around pristine, fresh, high quality fish. Even the presence of exploratory or permanent oil and gas extraction equipment within and in close proximity to these fisheries has the potential to impact the value and marketability of salmon harvested from these districts. Oil pollution could result in harmful effects to fisheries through direct lethal or sub-lethal effects to fish stocks. In the case of large spills and blowouts, fishers could be forced to change fishing locations (Davis et al. 1984). A large oil spill to nearshore beach and intertidal fish habitats could persist for long periods of time. A spill in Controller Bay or Katalla Bay could reach the Copper River delta due to the prevailing winds and currents. Fisheries could be closed due to actual or perceived contamination of fish or shellfish (BOEM 2016). Closures, contaminated salmon losses, and gear fouling during peak salmon fishing would result in income loss for commercial fishers (Burden et al. 1990). Moreover, periods of commercial fishing restriction or closure can result in over-escapement of anadromous salmon, which in turn can produce smaller returns of fish in the future (Schmidt et al. 1995).

After the Deepwater Horizon accident in the Gulf of Mexico there were no documented observable fish kills in offshore waters. This is likely due to adult fish being able to avoid the most heavily contaminated waters. Many fisheries were closed due to the potential for contaminated fish and chemical screening was implemented. Polycyclic aromatic hydrocarbons were detected in samples of fish taken in May-August 2010. However, within one year of the spill polycyclic aromatic

hydrocarbons levels were below the public health limits established by the National Oceanic and Atmospheric Administration, the federal Food and Drug Administration, and the Gulf Coast states. The chemical monitoring found little evidence for seafood being significantly contaminated, and fishermen-led sampling of fish fillets demonstrated no elevated concentrations of polycyclic aromatic hydrocarbons, select metals, or components of the dispersants used (Beyer et al. 2016).

Noise and activities associated with seismic surveys and construction could result in localized temporary displacement of fishery resources and fishers. Seismic surveys conducted during the commercial drift gillnetting season could have incremental cumulative effects on the commercial fishing industry because survey vessels and equipment would interfere with fishing. Platforms or rigs located near fishing locations could impact the drift gillnet fishery by reducing the area available for fishing. Bottom trawl and drift gillnet fisheries within the License Area could encounter problems with infrastructure vessel traffic, and docks that may create gear entanglement hazards. Fishers could be displaced from the Bering River drift gillnet district if there are concerns that gear could be disturbed or damaged by vessel traffic associated with oil and gas development in the License Area. Long-line and drift gillnet fisheries are not likely to interact with subsea pipelines (Gómez and Green 2013).

Local guides and lodge owners in the License Area say that their clients are seeking quiet, solitude, and a wilderness-like experience. Equipment movement and storage could produce visual disturbance to people sportfishing or hunting in the License Area and diminish the recreational experience for coho anglers and game or waterfowl hunters. Oil and gas activities could temporarily interrupt sportfishing and hunting and detract from the sense of serenity and remoteness (USFS 2002).

The 1989 *Exxon Valdez* oil spill had direct impacts to commercial fish stocks, due in part to over-escapement. Emergency closures of fisheries for salmon, herring, crab, shrimp, rockfish and sablefish led to dramatic declines in income of commercial fishers (Schmidt et al. 1995; EVOSTC 2014). In the year following the spill, sport anglers likely avoided areas contacted by the oil with participation decreasing in numbers by 13 percent and harvest by 10 percent, following 5 years of steady increases before the spill (Mills 1992). Disruptions to the commercial fishing industry in the oil spill area continued many years after the spill in the form of changes in average earnings, ex-vessel prices, and values of fishing permits. Although pink salmon and sockeye salmon were considered recovered from the spill by 2002, Pacific herring, in decline before the spill, were still listed as “not recovering” in 2014, and therefore the fisheries that depend on herring were also considered in the process of recovery but not fully recovered. Direct cause-effect relationships between oil spills and changes in fisheries are difficult to demonstrate because of the many confounding factors that also affect fisheries, such as the world supply of fishery products, regulatory and allocation changes, closures for management of sea lions, and increased competition among user groups (EVOSTC 2014).

### **3. Mitigation Measures and Other Regulatory Protections**

Oil and gas activities could potentially have cumulative effects on subsistence uses, commercial and sport fisheries, and hunting and trapping through cumulative effects on habitat, fish and wildlife populations, access, or competition among user groups. Measures in this finding, along

with regulations imposed by state, federal, and local agencies, are expected to avoid, minimize, and mitigate many potential cumulative effects. In addition to mitigation measures addressing fish, wildlife, and habitat, other mitigation measures specifically address prohibition of offshore drilling, siting of facilities, harvest interference avoidance, public access, road construction, and oil spill prevention.

Specific harvest interference mitigation requires:

- Restriction on unreasonable conflicts with commercial, subsistence, or sport fish and wildlife harvest activities;
- Maintenance of traditional and customary access to subsistence areas;
- Requirements for consultation with commercial and sport fishery user groups, nearby communities, and Native organizations for assistance in identifying and contacting local subsistence, commercial, and sport users;
- Through consultation require the licensee to adjust exploration activities to avoid interference with subsistence, commercial, and sport harvests; and
- Drilling from offshore locations is prohibited.

Measures in this best interest finding, along with regulations imposed by state, federal and local agencies, are expected to avoid, minimize, and mitigate potential cumulative effects on fish and wildlife uses. A complete listing of mitigation measures is found in Chapter Nine.

## **G. Reasonably Foreseeable Cumulative Effects on Historic and Cultural Resources**

### **1. Potential Cumulative Effects on Historic and Cultural Resources**

The Alaska Heritage Resources Survey database indicates that there are 126 reported cultural resource sites within the solicitation area for this license and 21 reported cultural resource sites within the License Area. The resource types include paleontological sites, prehistoric sites, Russian-era occupation sites, and early 20th century era sites (AHRs 2018). Historic buildings, cultural sites, and prehistoric archeological sites may be encountered during field-based activities, and these resources could be damaged or destroyed by ground disturbance during exploration, development, and production.

If development occurs, impacts and disturbances to the historic and cultural resources could be associated with installation and operation of oil and gas facilities, including drill pads, roads, airstrips, pipelines, processing facilities, and any other ground disturbing activities. Damage to archaeological sites may include: direct breakage of cultural objects; damage to vegetation and the thermal regime, leading to erosion and deterioration of organic sites; shifting or mixing of components in sites resulting in loss of association between objects and damage or destruction of archeological or historic sites by oil spill cleanup crews collecting artifacts (Clough et al. 1987).

Spills can have an indirect effect on archaeological sites by contaminating organic material, which would eliminate the possibility of using carbon C-14 dating methods (Clough et al. 1987). The effects of cleanup activity on these resources are minor because the work plan for cleanup is constantly reviewed, and cleanup techniques are changed as needed to protect archaeological and cultural resources (Bittner 1996).

For example, historic and cultural resources may be encountered during field-based activities, and these resources could be affected by accidents such as an oil spill. Following the Exxon-Valdez oil spill, 24 archaeological sites experienced adverse effects including oiling of the sites, disturbance by clean-up activities, and looting and vandalism. Monitoring of the sites over a 7-year period indicated that vandalism continued to be a minor problem, and that although some sites were initially badly damaged by oiling, residual oil did not appear to be contaminating known sites, and sites were considered recovered (Reger et al. 2000; EVOSTC 2014).

## **2. Mitigation Measures and Other Regulatory Protections**

Because historic and cultural resources are irreplaceable, caution is necessary to not disturb or impact them. AS 41.35.200 addresses unlawful acts concerning cultural and historical resources. It prohibits the appropriation, excavation, removal, injury or destruction of any state-owned cultural site. In addition, all field-based construction and spill response workers are required to adhere to historic properties protection policies that reinforce these statutory requirements and to immediately report any historic property that they see or encounter (AHRs 2018).

Because of the varying circumstances of occurrence surrounding the location and vulnerability of cultural resources, the significance of future impacts to these resources is difficult to assess in terms of the cumulative case. However, if the protections that are currently in place carry forward, then the cumulative impact would be expected to be minor within the License Area. As in the past, assessments to identify and protect cultural resources before initiation of surface disturbing activities is a major factor in reducing future cumulative adverse impacts to cultural resources. A complete listing of mitigation measures is found in Chapter Nine.

## **H. Reasonably Foreseeable Fiscal Effects of the Disposal and Subsequent Activity on the State and Affected Municipalities and Communities**

This section considers and discusses the fiscal effects of licensing activities. Licensing and subsequent activity may generate income for state government, with additional benefits that include increased revenue sharing, creation of new jobs, and indirect income multiplier effects. Fiscal effects may be statewide and local.

### **1. Fiscal Effects on the State**

Alaska's economy is heavily reliant on revenues from oil and gas production, which consists of bonus payments, licensing fees, rentals, royalties, and various forms of taxes. In total petroleum revenues account for 80 percent of unrestricted general fund revenues. In fiscal year 2018, general

fund revenues were used for government operations, basic services and capital improvements. The Alaska Department of Revenue reported unrestricted general fund revenues from petroleum of \$1.94 billion in fiscal year 2018, forecasted to climb to \$2.21 billion in fiscal year 2019 (ADOR 2018).<sup>4</sup>

Should an exploration license be awarded in the Gulf of Alaska, there will be positive initial revenue. To receive an exploration license, the licensee must provide the state with a licensing fee of \$1 per acre of exploration area (AS 38.05.132(c)(6)). Given that exploration acreage must range between 10,000 and 500,000 acres (AS 38.05.132(c)(2)), the one-time licensing fee associated with the proposed exploration license is \$65,773. Beyond the licensing fee, the licensee is also required to provide the state with a performance bond in an amount equal to the unfulfilled portion of the work commitment made during the award of the license. Should the work commitments be unfulfilled, the state may call against this bond and receive a cash consideration in an amount up to the penal sum of the bond. Alternatively, if the licensee commits direct expenditures equal to or exceeding the work commitment, then that bond is returned to the licensee.

While a short-term revenue increase is expected if an exploration license is issued, the ultimate revenue impact associated with exploration in the Gulf of Alaska is presently indeterminate. The ultimate revenue impact of issuing an exploration license depends critically on whether commercial quantities of hydrocarbons are ultimately found and placed into production.

The License Area lies south of 68 degrees North latitude and outside of the Cook Inlet sedimentary basin, a region commonly referred to as “Middle Earth.” While most exploration tax credits have expired for the North Slope and Cook Inlet basins, many remain in effect for Middle Earth. For example, qualified capital exploration expenditures in Middle Earth may qualify for a 10 percent Qualified Capital Expenditure Credit for Exploration (AS 43.55.023(a)(2)). Certain expenditures for exploration wells in Middle Earth are eligible for a 20 percent Well Lease Expenditure Credit for Exploration (AS 43.55.023(l)(2)). Middle Earth explorers may also qualify for up to a 40 percent credit for certain exploration well expenses through the end of 2021 (AS 43.55.025). Should these credits be claimed for an exploration program that ultimately fails to identify commercial quantities of hydrocarbons, the net revenue impact of the proposed exploration license could be negative.

However, should exploration activity find commercial quantities of oil and gas, the net revenue impact may be positive. By statute, if the licensee completes the work commitments required under the exploration license, the licensee may request that some portion of the exploration acreage granted under the license be converted to oil and gas leases (AS 38.05.134). Under the assumption that at least some part of the License Area is converted to oil and gas leases, and these leases are placed into production, the fiscal benefits to the state will include royalties, rents, state corporate income tax, oil and gas property tax, and production tax.

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<sup>4</sup> While still heavily dependent on revenues from oil and gas, this represents a material decline from the decade between 2004 and 2013 when between 87 percent and 93 percent of unrestricted general fund revenues were derived from petroleum (ADOR 2018).

**a. Royalties**

By statute, should any of the exploration acreage be converted into oil and gas leases, these leases must reserve for the state a royalty interest of at least 12.5 percent (AS 38.05.134(3)). While currently lacking an empirical basis to determine the expected magnitude of the royalty payments from the exploration acreage, the royalty revenue would be positive. Royalties received from oil and gas leases are a material source of revenue for the state. In fiscal year 2018, oil and gas royalties provided \$977.8 million in unrestricted general fund revenue, representing over 40 percent of total unrestricted general funds revenues in fiscal year 2018. Beyond contributing to the general fund, at least 25 percent of the cash flows generated by royalties must be deposited into the Alaska Permanent Fund (\$356.1 million in fiscal year 2018) and 0.5 percent of royalty revenue must be placed in the Public-School Trust (\$7 million in fiscal year 2018; ADOR 2018).

**b. Rents**

Should exploration acreage granted under the proposed license be converted into oil and gas leases, the state would also collect rental revenue from these leases. Oil and gas leases attributable to exploration licensing would yield yearly rents of \$3 per acre until the income to the state from royalty under that lease exceeds the rental income to the state under that lease for that year (AS 38.05.134(4)). Due to the uncertainty surrounding the number of exploration acres that could ultimately be converted to oil and gas leases and the uncertainty around the time to production, it is not possible to provide a definitive estimate of revenues from rental payments. However, with reasonable certainty the yearly revenue impact would be non-negative, but likely small. The maximum the state could expect in rental payments at \$3 per acre from this license is \$197,319.00 per year if the entirety of the License Area were converted to leases.

**c. State Corporate Income Tax**

The state may also receive benefits from exploration licensing through increased corporate income tax receipts. The State of Alaska levies an income tax on Alaska apportioned income for all oil and gas C-corporations. The corporate income tax is a progressive tax levied on Alaska apportioned income with a highest marginal tax rate of 9.4 percent (ADOR 2019a). In fiscal year 2018, \$67.9 million in oil and gas corporate income tax revenues were received by the state (ADOR 2018). Should the proposed exploration activity result in hydrocarbon production, the organization(s) that place that resource into production may generate sufficient income to owe a state corporate income tax liability, thereby creating a positive revenue benefit to the state.

Beyond the potential direct revenue benefits provided by the corporate income tax received from the entities that develops the resource, there may be a positive revenue impact from the economic activity associated with exploration and development activities facilitated by an exploration license. When a dollar is spent, or a worker hired, the economic impact of that action is not siloed solely to the business receiving the dollar or the worker earning the wage. Rather, a cascading economic effect is set in motion in which the business spends the dollar to buy goods and services, the worker builds a home, and so on. The change in the total volume of goods and services produced as a consequence of the initial economic injection is commonly referred to as the economic multiplier. To the extent that exploration has a positive multiplier, and the additional economic activity is retained in Alaska, then some of the multiplier may be captured by state corporate income taxes.



#### **d. Oil and Gas Property Tax**

Oil and gas property taxes are levied each year on the full and true value of exploration, production, and pipeline transportation properties at a rate of 2 percent of the assessed value (AS 43.56). Municipalities may levy a tax on oil and gas property, and the tax paid to a municipality is credited against the property tax paid to the state. However, there is presently no local municipal- or borough-level property tax in the License Area; any property tax benefits from the exploration or development in the License Area will be captured by the state. In state fiscal year 2018, total state oil and property tax revenues were \$121.6 million (ADOR 2018).

#### **e. Production Tax**

If the License Area is converted to leases, oil and gas produced in the License Area is subject to the state production tax (AS 43.55), which is based on the net value of production. The License Area has a tax ceiling at 4 percent of the gross value at the point of production (AS 43.55.011(p))<sup>5</sup>. This 4 percent tax ceiling applies to production for the first seven years of a development and production must begin before 2027.

Thus, should a commercial discovery be made in the License Area, and should that discovery be placed into production, the state would receive direct revenue benefits through the production tax.

#### **f. Alaska Permanent Fund**

At least one-quarter of rental, royalty, and bonus revenue received by the state is deposited into Alaska's sovereign wealth fund, the Alaska Permanent Fund. In fiscal year 2018, oil and gas revenues contributed \$356.1 million to the Alaska Permanent Fund (ADOR 2018). As of January 31, 2019, the Alaska Permanent Fund had a balance in excess of \$63 billion (APFC 2019).

#### **g. Public School Trust Fund**

The Public-School Trust Fund is an endowment trust fund created by the legislature to provide funding to the state public school system (AS 37.14.110). Each year, 0.5 percent of the receipts from the state's management of its public lands, including royalties and rent, must be deposited into the School Trust Fund (AS 37.14.150). The legislature may then appropriate up to 5 percent of the market value of the fund for the purpose of funding public education. The principal balance of the fund in fiscal year 2018 was just under \$650 million dollars (ADOR 2019b).

### **2. Fiscal Effects on Municipalities and Communities**

As discussed above, the economic benefit of exploration activity does not necessarily accrue only to the organizations involved in the exploration activity. Rather, the benefits could circulate throughout the economy and multiply the effect of the spending associated with the exploration license. The distribution of the local-level economic benefits associated with the exploration activity are difficult to forecast and depend on multiple factors, including but not limited to: aggregate spending on exploration, the size and commerciality of any identified resource, how spending is distributed between goods and services, where those goods and services are sourced,

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<sup>5</sup> Gross Value at the Point of Productions is the well-head value of taxable, produced oil and gas.

and the behavior of municipalities and communities in response to increased oil and gas activity in the localities. As was the case when considering the fiscal effect of the proposed exploration activity on the state, the empirical basis for making quantitative forecasts of local impacts is lacking. However, it is possible to discuss the avenues through which benefits may accrue should the exploration license lead to production.

### **a. Property Tax**

The License Area is contained in the unorganized Valdez-Cordova Borough. As such, the License Area would not currently levy a petroleum property tax. However, under current law, a share of the revenue benefit that would flow to the state could be captured by the locality should it choose to institute an oil and gas property tax.

### **b. Community Assistance Program**

Local municipalities and communities may also indirectly benefit from the exploration license through the Community Assistance Program (CAP). The CAP takes revenues received by the state in the form of corporate income taxes and distributes non-locally generated, unrestricted revenue to communities and municipalities throughout the state (AS 29.60.855). In fiscal year 2016, \$57 million in assistance was distributed to 229 communities in Alaska, with nearly 90 percent of this revenue coming from oil and gas (McDowell Group 2017). The City of Cordova will receive \$75,000 through the CAP for Program Year 2021 (DCCED 2020).

### **c. Employment**

The oil and gas sector plays a prominent role in the Alaska labor market. In 2017, a study prepared for the Alaska Oil and Gas Association estimated the employment and wage impact of 14 of the largest oil and gas organizations in Alaska.<sup>6</sup> It found that 45,575 direct, indirect, and induced jobs were related to the spending of the 14 companies, with roughly \$3.1 billion in wages tied to their spending. Across the state, an estimated 103,875 (32 percent) Alaskan wage and salary jobs were related to the oil and gas industry, with oil and gas responsible for \$6 billion (35 percent) of the wages in the state (McDowell Group 2017).

The level, and geographical distribution, of the employment effect driven by the exploration license will depend on the size of any commercial resource that is identified. If the exploration program does not find material quantities of hydrocarbons, the labor market effect of the exploration license would likely be negligible. However, should the exploration program find commercial quantities of hydrocarbons and should these hydrocarbons be placed into production, the labor market effect of the exploration license could be significant.

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<sup>6</sup> The 14 organizations were: BP Exploration (Alaska) Inc., Chevron, Petro Star Inc., Shell Exploration & Production Company, Alyeska Pipeline Service Company, BlueCrest Energy Inc, Caelus Energy, LLC, ConocoPhillips Alaska, Inc, ExxonMobil Production Company, Furie Operating Alaska, Glacier Oil & Gas, Great Bear Petroleum, Hilcorp Energy Company, and Tesoro Alaska Company.

## **I. Other Reasonably Foreseeable Effects on Municipalities and Communities Near the License Area**

### **1. Access**

The State of Alaska is the predominant landowner in the License Area, although much of the area is offshore. Existing transportation systems are very limited but include unmaintained roads and winter trails. Increased vessel traffic may cause navigation hazards and congestion, especially during the fishing season. Temporary barge landing sites could also be developed because there is no road access to the License Area. Access to the License Area would be primarily by vessels and aircraft. Vessel and air traffic would incrementally increase with exploration and development of oil and gas projects and traffic increases would be cumulative with existing traffic levels.

Temporary roads may be constructed for onshore exploration drilling, and roads, pads, and airstrips may be constructed for onshore projects or to support offshore projects. New roads may also facilitate access to remote locations, if they are open to the public. New or improved access could create community development, land use planning, or fish and wildlife management issues. Use of existing roads and trails for transportation of heavy equipment and supplies, especially during construction, could degrade the condition of existing roads or trails.

Cumulative increases in vessel, road, and air traffic would likely be greatest during construction, when more equipment and personnel are generally required. Expected increases in permanent road infrastructure would also be cumulative, although impacts from increased traffic would be reduced during operation compared to construction activities.

### **2. Recreation and Tourism**

Despite the remote nature and difficulty of access to the License Area, recreation and tourism are important to the culture of the Gulf of Alaska and Prince William Sound communities and are a major economic resource. Sightseeing, fishing, camping, hunting, boating, hiking, cross-country and backcountry skiing, snow machining, and all-terrain vehicle use are popular activities. Existing public recreation use of the area is limited because of its remoteness and inaccessibility and primarily consists of fly-in hunting and fishing (DNR 1988). Outdoor recreational activities are often closely tied to fish and wildlife habitats and populations. Habitat loss, alteration, and disturbance effects from oil and gas activities on fish and wildlife populations discussed in the preceding sections could result in cumulative effects on recreation and tourism.

Where oil and gas activities coincide with or restrict access to fishing or hunting areas, and/or campgrounds or other recreation areas, a visitor's use or enjoyment of the area could be adversely affected. If visitors avoid or reduce travel and spending within the area, decreased use and associated revenues to businesses and the local economy could result. Reduced use of the area for recreation or by tourists due to conflicts with oil and gas activities could potentially be cumulative across the License Area and surrounding Gulf of Alaska Region.

### **3. Mitigation Measures and Other Regulatory Protections**

Although oil and gas activities after leasing could potentially have effects on municipalities and communities in the Gulf of Alaska and Prince William Sound areas, measures in this best interest finding, along with regulations imposed by state, federal and local agencies, are expected to avoid, minimize, or mitigate potentially negative effects.

Mitigation measures address critical habitat areas and state game refuges, protection of streams, siting of facilities, public access, navigable waters, and public water supplies. A complete listing of mitigation measures is found in Chapter Nine.

### **J. Mitigation Measure Evaluation**

The reasonably foreseeable cumulative effects of oil and gas activities discussed in this chapter would not, standing alone, warrant a finding that the license is not in the State's best interest. Mitigation measures are designed to minimize or eliminate the potential effects on fish, wildlife, habitat, cultural resources, and other uses of the License Area and have proven effective in mitigating these effects on other land disposal areas for oil and gas activities. Refer to Chapter 1 for an explanation of the director's decision in this finding.

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# Chapter Nine: Mitigation Measures

## Contents

	<b>Page</b>
A. Mitigation Measures .....	9-1
1. Facilities and Operations .....	9-1
2. Fish Wildlife and Habitat .....	9-3
3. Subsistence, Commercial, and Sport Harvest Activities .....	9-5
4. Fuel and Hazardous Substances .....	9-6
5. Access .....	9-7
6. Prehistoric, Historic, and Archaeological Sites .....	9-7
7. Hiring Practices .....	9-8
B. Definitions .....	9-8

## Chapter Nine: Mitigation Measures

The mitigation measures presented in this Gulf of Alaska exploration license best interest finding were developed under the authority of AS 38.05.035(e) to mitigate potential effects of license and lease-related activities, after considering all information made known to the director at this time. The conditions and limitations described in this chapter apply to oil and gas activities in, on, or accessing all licensed land and waterbodies regardless of the ownership status of the land. The licensee would be subject to applicable local, state, and federal laws and regulations, as amended.

The mitigation measures comply with AS 38.05.133(f)(1) to ensure protection of the best interests of the State of Alaska. The measures also honor the Copper River Delta Fish and Wildlife Management Area Memorandum of Understanding (MOU), which requires DNR to consider fish and wildlife values on state lands within the management area. These measures were created in coordination with the participating agencies in the MOU. The following mitigation measures are considered protective of the fish, wildlife, habitat, and their uses, as well as the cultural resources and access of the License Area. However, the director determined the potential benefits of issuing the exploration license do not outweigh the potential negative effects, and issuance of the Gulf of Alaska exploration license does not best serve the interests of the State of Alaska. Therefore, these mitigation measures are included for reference to help the reader understand the restrictions and protections in place that impacted the viability of this exploration license.

### A. Mitigation Measures

#### 1. Facilities and Operations

- a. Oil and gas facilities, including pipelines, shall be designed using industry-accepted engineering codes and standards. Technical submittals to the DO&G that reflect the “practice of engineering,” as defined by AS 08.48.341, must be sealed by a professional engineer registered in the State of Alaska.
- b. A plan of operations shall be submitted to and approved by DO&G before conducting exploration, development, or production activities in accordance with 11 AAC 83.
- c. Facilities shall be designed and operated to minimize sight and sound impacts in areas of high residential, recreational, and subsistence use and important wildlife habitat.
- d. The siting of facilities, including roads, airstrips, and pipelines, landward of mean high water is prohibited within ½ mile from the mean high-water mark, 500 feet of all fish-bearing waterbodies, and ½ mile of the banks of the Katalla, Bering, Nichawak, Campbell, Edwardes, and Okalee rivers, and Arvesta Creek as measured from the ordinary high-water mark. Facilities may be sited, on a case-by-case basis, in consultation with ADF&G, within the ½-mile buffer if the lessee demonstrates that siting of such facilities outside this buffer zone is not feasible or prudent, or that a location within the buffer is environmentally preferable.
- e. The siting of facilities or infrastructure, including platforms, jack-up rigs, and pipelines, seaward of mean high water is prohibited.

- f. Impacts to important wetlands shall be minimized to the satisfaction of the director, in consultation with ADF&G and Alaska Department of Environmental Conservation (ADEC). The director will consider whether facilities are sited in the least sensitive areas.
- g. Road, utility, and pipeline crossings shall be aligned perpendicular or near perpendicular to watercourses.
- h. Pipelines
  - i. In areas with above ground placement, pipelines shall be designed, sited, and constructed to allow for the free movement of wildlife and to avoid significant alteration of large ungulate movement and migration patterns.
  - ii. At a minimum, above ground pipelines shall be elevated seven feet, as measured from the ground to the bottom of the pipeline, except where the pipeline intersects a road, pad, or a ramp installed to facilitate wildlife passage. A licensee shall consider snow depth in relation to pipe elevation to ensure adequate clearance for wildlife.
  - iii. Pipelines that must cross marine waters will be constructed beneath the marine waters using directional drilling techniques. Offshore pipelines must be located and constructed to prevent obstruction to marine navigation and fishing operations.
  - iv. Pipelines and gravel pads shall facilitate the containment and cleanup of spilled fluids.
  - v. Pipelines must be located and constructed in consultation with ADF&G and the local borough
- i. Exploration roads, pads, and airstrips must be temporary. Use of gravel roads, pads, and airstrips may be permitted on a case-by-case basis by the director, in consultation with the Division of Mining, Land, and Water (DMLW) and ADF&G. Approval for use of existing facilities will depend on the extent and method of restoration needed to return these structures to a usable condition.
- j. Artificial gravel islands and bottom founded structures shall not be in active stream channels or active navigation channels in nearshore shallow waters, except as provided for in (k).
- k. Each proposed structure will be reviewed on a case-by-case basis. Causeways, docks, artificial gravel islands, and bottom-founded structures may be permitted if the director, in consultation with ADF&G and ADEC, determines that the structures are necessary for field development and that no practicable alternatives exist. A monitoring program may be required to address the objectives of water quality, free passage of fish, and access for resource users. Mitigation shall be required where significant deviation from objectives occurs.
- l. Upon abandonment of material sites, drilling sites, roads, buildings or other facilities, such facilities must be removed, and the site rehabilitated to the satisfaction of the director, unless the director, in consultation with DMLW, ADF&G, ADEC, and any non-state surface owner, determines that such removal and rehabilitation is not in the state's interest.

- m. Material sites required for oil and gas activities shall be:
  - i. restricted to the minimum necessary to develop the field efficiently and with minimal environmental damage;
  - ii. where practicable, material sites must be designed and constructed to function as water reservoirs for future use; and
  - iii. located outside active floodplains of a watercourse unless the director, after consultation with DMLW and ADF&G, determines that there is no practicable alternative, or that a floodplain site would enhance fish and wildlife habitat after mining operations are completed and the site is closed.
- n. The director may include plan stipulations if necessary, to reduce or eliminate adverse impacts to fish and wildlife or to protect the environment.
- o. The siting of permanent facilities is prohibited within 1/4 mile of important habitat including breeding and nesting areas, as well as migratory bird staging areas, and seabird colonies to reduce impacts on avian species. Important habitat will be delineated in consultation with the agencies included in the Copper River Delta Fish and Wildlife Management Area Memorandum of Understanding and the Bering River-Controller Bay Trumpeter Swan Management Area Cooperative Agreement.
- p. Powerlines must be buried in the proposed license area to avoid and reduce collisions of migratory birds with overhead powerlines.
- q. Lights must be down-shielded to reduce potential bird collisions with buildings and other vertical structures in the License Area.
- r. Motion detection type lighting must be installed on permanent facilities in the License Area to reduce the attraction of birds to steady burning lights and potential collision with structures.
- s. A disturbance buffer of 660 feet must be implemented to reduce impacts to bald eagles and to avoid blasting and other activities that produce extremely loud noises within 0.5 mile of bald eagle nests (or within one mile in open areas), unless greater tolerance to the activity (or similar activity) has been demonstrated by the eagles in the nesting area.
- t. Gravel fill is prohibited in tidelands, except limited gravel fill may be used for docks where pile supported, or floating structures are not environmentally preferable. Construction of temporary or permanent airstrips or roads in intertidal areas is prohibited. Outside of tidelands, drill pads, airstrips, and roads may be allowed, or use of gravel roads, pads, and airstrips during the development phase may be permitted on a case-by-case basis by the director, in consultation with DMLW and ADF&G.
- u. Drilling in offshore tracts will only be conducted directionally from onshore locations unless the licensee proposes an alternative offshore location that is environmentally preferable to DO&G, after consultation with ADF&G, DMLW, and ADEC.

## **2. Fish Wildlife and Habitat**

- a. Surface entry will be prohibited within the Copper River Delta Critical Habitat Area.

- b. Any water intake structures in fish bearing waters shall be designed, operated, and maintained to prevent fish entrapment, entrainment, or injury. All water withdrawal equipment must be equipped with fish screening devices approved by ADF&G.
- c. Removal of snow from fish-bearing rivers, streams, and natural lakes shall be subject to prior written approval by ADF&G. Compaction of snow cover overlying fish-bearing waterbodies is prohibited except for approved crossings.
- d. The director, in consultation with ADF&G, may impose seasonal restrictions on activities located in, or requiring travel through or overflight of large ungulate calving and wintering areas during the plan of operations approval stage.
- e. Bears
  - i. A licensee must consult with ADF&G before commencing any activities to identify the locations of known bear den sites that are occupied in the season of proposed activities.
  - ii. Exploration and production activities shall not be conducted within one-half mile of occupied bear dens unless alternative mitigation measures are approved by ADF&G.
  - iii. A licensee who encounters an occupied bear den not previously identified by ADF&G shall report it to the Division of Wildlife Conservation, ADF&G, within 24 hours. The licensee will avoid conducting mobile activities one-half mile from discovered occupied dens unless alternative mitigation measures are approved by the director, with concurrence from ADF&G. Non-mobile facilities will not be required to relocate.
- f. For projects in proximity to areas frequented by bears, the lessee is required to prepare and implement a human-bear interaction plan designed to minimize conflicts between bears and humans. The plan will include measures to:
  - i. Minimize attraction of bears to facility sites;
  - ii. Organize layout of buildings and work areas to minimize interactions between humans and bears;
  - iii. Warn personnel of bears near or on facilities and the proper actions to take;
  - iv. If authorized, deter bears from the drill site;
  - v. Provide contingencies in the event bears do not leave the site;
  - vi. Discuss proper storage and disposal of materials that may be toxic to bears; and
  - vii. Provide a systematic record of bears on the site and in the immediate area.
- g. The licensee must avoid disturbance around estuaries, bird rookeries, sea lion haulouts and rookeries, harbor seal haulouts and pupping areas, and essential waterfowl and shorebird areas (within ¼ mile) from April 1 to September 30.
- h. Exploration, development, and major maintenance will be allowed between November 1 and March 31. Other seasonal restrictions may be applied on activities located within the Copper River Delta Fish and Wildlife Management Area (CRDFWMA) to minimize impacts to important habitats. These restrictions will be developed by the director, in consultation with the CRDFWMA Memorandum of Understanding (MOU) agency signatories. Routine maintenance and emergency repairs will be permitted on a year-round

basis during the production phase. A detailed plan describing routine maintenance activity between April 1 and October 31 in these areas must be included in the plan of operations.

- i. Migratory Birds
  - i. The director, in consultation with ADF&G, will impose seasonal restrictions on activities located in, or requiring travel through or overflight of, important trumpeter swan nesting and brooding sites, or important spring and fall migratory bird staging areas, during approval of a plan of operations.
  - ii. Seasonal Restrictions may be applied, and surface entry prohibited within one-half mile of trumpeter swan nesting sites and within ¼ mile of seabird breeding colonies. The siting of permanent facilities, including roads, material sites, storage areas, power lines, and above ground pipelines will be prohibited within ¼ mile of known nesting sites and breeding colonies.
  - iii. Permanent, staffed facilities must be sited outside of identified trumpeter swan nesting and brood rearing areas, seabird colonies, and migratory bird spring and fall staging areas, unless the director, in concurrence with ADF&G, approves a proposed alternative.
- j. The director, in consultation with ADF&G, will impose seasonal restrictions and sound pressure levels on seismic activities in or near fresh water, estuarine, and marine waters to minimize impacts to fish and marine mammals. The director, in consultation with ADF&G, will impose sound pressure levels for the use of explosives in or near fish bearing streams and lakes. Blasting criteria have been developed by ADF&G and are available upon request.
- k. To minimize disturbances to marine mammals, consultation with federal or other marine mammal specialists should be conducted.
- l. Open reserve pits are prohibited to minimize impacts to wildlife, especially birds.
- m. During seismic surveys, utilize ramp-up procedures to allow marine species to move away from the source before they can be exposed to detrimental sound levels. When salmon are present, such as during migration periods, provide sufficient breaks in the survey to allow them to transit through the area.
- n. Use marine vibroseis instead of airguns when possible. If that is not possible, use the least powerful airguns that will meet the needs of the survey and survey the smallest area possible to meet the needs of the project.

### **3. Subsistence, Commercial, and Sport Harvest Activities**

- a. License and lease-related use will be restricted if necessary, in consultation with ADF&G to prevent unreasonable conflicts with subsistence, commercial, or sport harvest activities. Traditional and customary access to subsistence areas will be maintained unless reasonable alternative access is provided to subsistence users. “Reasonable access” is access using means generally available to resource users. Licensees will consult with ADF&G, nearby communities, and Native organizations for assistance in identifying and contacting local subsistence users.

- b. Before submitting a plan of operations that has the potential to disrupt commercial, sport, or subsistence activities, the licensee will consult with the potentially affected commercial, sport, or subsistence communities (collectively “parties”) and ADF&G to discuss the siting, timing, and methods of proposed operations and safeguards or mitigating measures that could be implemented by the operator to prevent unreasonable conflicts. The parties will also discuss the reasonably foreseeable effect on commercial, sport, or subsistence activities of any other operations in the area that they know will occur during the licensee’s proposed operations. Through this consultation, the licensee will make reasonable efforts to ensure that activities are compatible with commercial, sport, and subsistence hunting and fishing activities and will not result in unreasonable interference with commercial, sport, and subsistence harvests.

#### **4. Fuel and Hazardous Substances**

- a. The licensee will ensure that secondary containment is provided for the storage of fuel or hazardous substances and sized as appropriate to container type and according to governing regulatory requirements in 18 AAC 75 and 40 CFR 112. Containers with an aggregate storage capacity of greater than 55 gallons that contain fuel or hazardous substances will not be stored within 100 feet of a waterbody, or within 1,500 feet of a current surface drinking water source.
- b. During equipment storage or maintenance, the site must be protected from leaking or dripping fuel and hazardous substances by the placement of drip pans or other surface liners designed to catch and hold fluids under the equipment, or by creating an area for storage or maintenance using an impermeable liner or other suitable containment mechanism.
- c. During fuel or hazardous substance transfer, secondary containment or a surface liner must be placed under all container or vehicle fuel tank inlet and outlet points, hose connections, and hose ends. Appropriate spill response equipment, sufficient to respond to a spill of up to five gallons, must be on hand during any transfer or handling of fuel or hazardous substances.
- d. The licensee will ensure that vehicle refueling will not occur within the annual floodplain, except as addressed and approved in the plan of operations. This measure does not apply to water-borne vessels.
- e. All independent fuel and hazardous substance containers must be marked with the contents and the licensee’s or contractor’s name using paint or a permanent label.
- f. A freshwater aquifer monitoring well, and quarterly water quality monitoring are required down gradient of a permanent storage facility, unless alternative acceptable technology is approved by ADEC.
- g. Waste from operations must be reduced, reused, or recycled to the maximum extent practicable. Garbage and domestic combustibles must be incinerated whenever possible or disposed of at an approved site in accordance with 18 AAC 60.
- h. Proper disposal of garbage and putrescible waste is essential to minimize attraction of wildlife. The licensee must use the most appropriate and efficient method to achieve this

goal. The primary method of garbage and putrescible waste is prompt, on-site incineration in compliance with State of Alaska air quality regulations. The secondary method of disposal is on-site storage in animal-proof containers with backhaul to an approved waste disposal facility.

- i. New solid waste disposal sites, other than for drilling waste, will not be approved or located on state property for exploration.
- j. The preferred method for disposal of muds and cuttings from oil and gas activities is by underground injection. Drilling mud and cuttings will not be discharged into lakes, streams, rivers, or wetlands. On-pad temporary cuttings storage may be allowed as necessary to facilitate annular injection and backhaul operations. Injection of non-hazardous oilfield wastes is regulated by Alaska Oil and Gas Conservation Commission through its Underground Injection Control Program for oil and gas wells.

## **5. Access**

- a. Except for approved off-road travel, exploration activities must be supported only by temporary roads, winter trails, existing road systems, or air service. Wintertime off-road travel across wetlands may be approved in areas where snow and frost depths are sufficient to protect the ground surface. Summertime off-road travel across wetlands may be authorized subject to time periods and vehicle types approved by DMLW. Exceptions may be granted by the director if it is determined that travel can be accomplished without damaging vegetation or the ground surface. Exceptions, including the use of gravel, may also be granted on a site-specific basis if it is determined that no practicable alternatives exist for constructing an exploration road or pad.
- b. Facilities and operations will not be located so as to block access to or along navigable or public waters as defined in AS 38.05.965.

## **6. Prehistoric, Historic, and Archaeological Sites**

- a. Before the construction or placement of any structure, road, or facility supporting exploration, development, or production activities, the licensee must conduct an inventory of prehistoric, historic, and archaeological sites within the area, including a detailed analysis of the effects that might result from that construction or placement.
- b. The inventory of prehistoric, historic, and archaeological sites must be submitted to the director and the Office of History and Archaeology (OHA), who will review and provide comments. If a prehistoric, historic, or archeological site or area could be adversely affected by a license activity, then the director, after consultation with OHA, will direct the licensee as to the course of action to take to avoid or minimize adverse effects.
- c. If a site, structure, or object of prehistoric, historic, or archaeological significance is discovered during license operations, the licensee shall report the discovery to the director as soon as possible. The licensee shall make all reasonable efforts to preserve and protect the discovered site, structure, or object from damage until the director, after consultation



with the State Historic Preservation Office, has directed the licensee on the course of action to take for its preservation.

## 7. Hiring Practices

- a. The licensee is encouraged to employ local and Alaska residents and contractors, to the extent they are available and qualified, for work performed in the License Area. Licensees shall submit, as part of the plan of operations, a hiring plan that shall include a description of the operator's plans for partnering with local communities to recruit, hire, and train local and Alaska residents and contractors. As a part of this plan, the licensee is encouraged to coordinate with employment and training services offered by the State of Alaska and local communities to train and recruit employees from local communities.
- b. A plan of operations application must describe the licensee's past and prospective efforts to communicate with local communities and interested local community groups.
- c. A plan of operations application must include a training program
  - i. for all personnel including contractors and subcontractors;
  - ii. designed to inform each person working on the project of environmental, social, and cultural concerns that relate to that person's job;
  - iii. using methods to ensure personnel understand and use techniques necessary to preserve geological, archaeological, and biological resources; and
  - iv. designed to help personnel increase their sensitivity and understanding of community values, customs, and lifestyles in areas where they will be operating.

## B. Definitions

**Facilities** – Any structure, equipment, or improvement to the surface, whether temporary or permanent, including, but not limited to, roads, pads, pits, pipelines, power lines, generators, utilities, airstrips, wells, compressors, drill rigs, camps, and buildings.

**Hazardous substance** – As defined under 42 USC 9601 – 9675 (Comprehensive Environmental Response, Compensation, and Liability Act of 1980).

**Important wetlands** – Those wetlands that are of high value to fish, waterfowl, and shorebirds because of their unique characteristics or scarcity in the region or that have been determined to function at a high level using the hydrogeomorphic approach.

**Important wildlife habitat** – Habitat that is of high value to fish, birds, marine and terrestrial mammals because of their unique characteristics or scarcity in the region. Delineation of important habitat will be made in consultation with the agencies included in the Copper River Delta Fish and Wildlife Management Area Memorandum of Understanding.

**Minimize** – To reduce adverse impacts to the smallest amount, extent, duration, size, or degree reasonable considering the environmental, social, or economic costs of further reduction.

**Plan of operation** – A plan of operations under 11 AAC 83.158 and a unit plan of operations under 11 AAC 83.346.

**Practicable** – Feasible in light of overall project purposes after considering cost, existing technology, and logistics of compliance with the mitigation measure.

**Secondary containment** – An impermeable diked area, portable impermeable containment structure, or integral containment space capable of containing the volume of the largest independent container. The container shall, in the case of external containment, have enough additional capacity to allow for local precipitation. Minimum secondary requirements are identified in 18 AAC 75.075.

**Temporary** – No more than 12 months.

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# Appendix A: Summary of Comments and Responses

## Contents

	Page
A. Comments and Responses to the Preliminary Written Finding issued August 2, 2019 .....	A-1
1. Process Issues .....	A-2
2. Fisheries Issues .....	A-3
3. Habitat Issues .....	A-3
4. Oil Spill Issues .....	A-4
5. Other Issues .....	A-6
a. Climate Change .....	A-6
b. Cultural Resources .....	A-6
6. Best Interests .....	A-6
B. MOA Meeting February 27, 2017 .....	A-13
C. MOU Consultation October 25, 2016 .....	A-13
1. USFS .....	A-13
2. BLM .....	A-13
3. USFWS .....	A-14
4. ADF&G .....	A-14
D. Comments and Responses to May 21, 2015 Solicitation .....	A-15
1. State of Alaska Division of Parks and Outdoor Recreation, Office of History and Archaeology ...	A-15
2. Trust Land Office .....	A-15
3. David Janka .....	A-16
4. Cascadia Wildlands .....	A-16
5. Barbara Rady Kazdan .....	A-17
6. US Department of Agriculture, Forest Service .....	A-18
7. David Lynn Grimes .....	A-19
8. Cordova District Fishermen United .....	A-19
9. Copper River Watershed Project .....	A-20
10. ADF&G Division of Habitat .....	A-21
11. Alaska Scallop Association .....	A-24
12. Lauren Padawer .....	A-24
13. Melissa Fraser .....	A-25
14. Ryan Schuetze .....	A-25
15. Erica Clark .....	A-26
16. US Department of Agriculture, Forest Service .....	A-26
17. Ellen Americus .....	A-27
18. Prince William Sound Audubon Society .....	A-27
19. Dune Lankard .....	A-28
20. Department of Interior, National Park Service .....	A-29
21. Eyak Preservation Council .....	A-30
22. Sarah Keller .....	A-32
23. US Department of Interior, Fish and Wildlife Service .....	A-32
24. Belle Mickelson .....	A-34
25. Julie Reynolds .....	A-34
26. Pete Lowney .....	A-36

# Appendix A: Summary of Comments and Responses

AS 38.05.035(e)(7) requires that written findings include a summary of agency and public comments, if any, and the Alaska Department of Natural Resources' (DNR's) responses to those comments. This appendix summarizes agency and public comments received on the Gulf of Alaska Oil and Gas Exploration License Preliminary Written Finding of the Director issued on August 2, 2019; and in response to the May 21, 2015 Notice of Intent to Evaluate the Oil and Gas Exploration License Proposal, Request for Additional Proposals, and Request for Comments on Exploration in the solicitation area, and the department's responses. This appendix also summarizes input from the US Department of Agriculture, Forest Service (USFS) related to the Memorandum of Agreement (MOA) for coastal lands adjacent to the Chugach National Forest and consultation with state and federal agencies for the Copper River Delta Fish and Wildlife Management Area Memorandum of Understanding (MOU).

## A. Comments and Responses to the Preliminary Written Finding issued August 2, 2019

Comments were received from 136 commenters (Table A-1), of which 13 commenters previously provided comments on the exploration license solicitation in 2015. Comments were primarily from the public, 89 percent, of which 41 percent identified themselves as commercial fishermen or commercial fishing/hunting/tourism guides. The City of Cordova issued a resolution opposing the issuance of the exploration license, and five non-governmental organizations (NGOs) teamed with the City of Cordova to oppose oil and gas exploration and drilling in Katalla and Controller Bay. An effort was made by the Eyak Preservation Council (EPC) to provide talking points and solicit their members to submit comments to the Division of Oil and Gas (DO&G) opposing the exploration license. Comments received were coded for 23 topics that were then grouped by issues for summary and response (Table A-2).

**Table A-1. Commenter groups for preliminary written finding comments.**

Commenter Group	Solicitation Comments Also Submitted	Preliminary Finding Comments Submitted
Agency	2	3
City of Cordova		1
Native Village of Eyak		1
Public	6	71
Commercial Fishers		40
Commercial Fishers/SERVS Responders		7
Commercial Fishing/Hunting/Tourism Guides		3
Non-Governmental Organizations	5	10
Total	13	136

\* SERVS = Ship Escort/Response Vessel System

**Table A-2. Issue and comment topics for preliminary written finding comment summary and response.**

Issue	Comment Topics	Topic Code
Process	Comment deadline	1
Process	Inadequate public notice	6
Fishery	Salmon habitat/salmon fisheries	2
Fishery	Commercial fishing conflicts	5
Fishery	Subsistence impacts	9
Fishery	Sport fisheries impacts	17
Habitat	Value of ecosystem	8
Habitat	State critical habitat area	11
Habitat	Marine mammals	12
Habitat	Migrating birds	15
Habitat	Seismic effects	16
Habitat	Wildlife concerns	20
Habitat	Tourism	21
Oil Spill	Contamination/spill impacts	3
Oil Spill	Spill response/contingency plan	4
Oil Spill	Inclement weather	14
Oil Spill	Exxon Valdez oil spill	19
Other	Climate change	7
Other	Cultural resources	10
Best Interest	Not in the state's best interest	13
Best Interest	Financial concerns	18
Best Interest	Previous exploration contamination	22
Best Interest	Transportation/logistics issues	23

\*Comment topics organized by issue for individual commenters are presented in Table A-3 at the end of this section.

## 1. Process Issues

Public review process issues included two requests for a comment period extension and two concerns about inadequate public notice. The comment period extension requests noted that area residents were busy with commercial fishing, subsistence harvest, and tourism and were unable to review and comment on the preliminary finding during the initial public comment period from August 2, 2019 to October 4, 2019. Inadequate notice concerns were that this project was not made very public, the notice was not listed on DNR's homepage, and that there was no notification through DNR's public notice subscription until August 7, 2019.

**DNR Response:** The Notice of Issuance of the Gulf of Alaska Oil and Gas Exploration License Preliminary Written Finding of the Director was published on August 2, 2019 with a comment deadline of October 4, 2019, consistent with the required 60-day review and comment period (AS 38.05.035(e)(5)(A)). The notice was published in the Anchorage Daily News, and the Cordova Times, as well as on the DNR's Online Public Notice, DO&G's newsroom, and DO&G's Exploration License webpages. Notices were sent to post offices in communities near the License

Area, and notification was sent by email and mail to the nearby tribal organizations, villages and native regional corporations. Notice was also sent by email to all subscribers to the DO&G Leasing listserv. In response to concerns, DO&G extended the deadline for public comments by an additional 30 days to November 4, 2019.

## 2. Fisheries Issues

Fisheries issues included conflicts between nearshore industry activities, offshore structures that could limit access, and potential for gear entanglement with jack-up rigs, production platforms or subsea pipelines. Oil and gas activities were considered to result in disruption and displacement of commercial, subsistence, and sport fish harvesters. Concern was expressed that vessel traffic associated with exploration, development, and production would interfere with fishing. The required ½ mile setback from anadromous waters was considered inadequate protection for salmon producing rivers by some commenters. Commercial fishing concerns were expressed by 76 percent of commenters; salmon habitat or salmon fishery impacts by 54 percent; subsistence impacts by 21 percent; and sport fishery impacts were expressed by 11 percent of commenters. Commenters were concerned that habitat damage and infrastructure from oil and gas exploration and development would reduce fish availability and quality, and the value of the area for guided sport fishing.

**DNR Response:** Mitigation measures include provisions that offshore tracts would be directionally drilled from onshore locations, unless an alternative environmentally preferable offshore location is proposed. Additional measures were added to that include a prohibition on offshore structures including platforms, jack-up rigs, and pipelines seaward of mean high water, consultation with potentially affected commercial, sport, or subsistence communities, and lease-related use restrictions to prevent conflicts with commercial, sport, personal use, and subsistence harvest activities. Restrictions would be developed in consultation with other agencies and the public to identify and avoid potential conflicts. Restriction may include alternative site selection, require directional drilling, seasonal restrictions, and other technologies. Seasonal restrictions within the Copper River Delta Fish and Wildlife Management Area, which encompasses the entire License Area, added to mitigation measures limit oil and gas exploration, development, and major maintenance activities to winter months between November 1 and March 31 and requires a detailed plan of routine maintenance activities scheduled to occur between April 1 and October 31. The required ½ mile setback for facilities from salmon-bearing rivers is considered by ADF&G to provide adequate protection for salmon habitat in the License Area. These mitigation measures are designed to avoid or minimize potential fisheries conflicts and wildlife disturbance. With implementation of these mitigation measures, potential conflicts can be resolved, and oil and gas exploration and development can proceed without substantial impacts on local commercial, subsistence, and sport fisheries and salmon habitats in the License Area.

## 3. Habitat Issues

Habitat issues identified by commenters included ecosystem value; Copper River Delta Critical Habitat Area; marine mammal haul-outs and feeding areas; migratory bird staging areas; offshore seismic survey impacts on habitats, fish, and marine mammals; displacement of wildlife; and tourism concerns. Of these topics, potential impacts of oil and gas activities on migrating birds, especially spring shorebird staging in Controller Bay were identified as a concern by 24 percent of

commenters, followed by ecosystem value by 20 percent of commenters. Commenters noted the high value of habitats within or near the License Area and stated that oil and gas exploration and development would degrade habitats, displace wildlife, and ruin tourism values. Offshore seismic surveys were noted to be damaging to benthic habitats and invertebrates, zooplankton, fish eggs and larvae, juvenile and adult salmon, and marine mammals.

**DNR Response:** DNR acknowledges and describes the value and use of fish and wildlife and their habitats within the License Area in Chapters Four and Five. Potential effects from normal oil and gas activities on area resources are described in Chapter Eight. These chapters have been revised to include additional current information on habitats, uses, and potential cumulative effects from oil and gas activities. Mitigation measures prohibiting oil and gas activities during spring, summer, and fall are protective of waterfowl, seabirds, and shorebirds during spring and fall migration staging in Controller Bay and during spring and summer nesting and brood-rearing. Additional wildlife and habitat protections include siting facilities away from bald eagle and trumpeter swan nests to avoid disturbance and prohibiting vessel disturbance to known marine mammal haul-outs and rookeries.

The description of potential seismic survey impacts on benthic habitats and invertebrates, zooplankton, fish eggs and larvae, juvenile and adult salmon, and marine mammals in Chapter Eight was revised. While potential impacts from seismic surveys cannot be entirely avoided, mitigation measures to protect Essential Fish Habitat (EFH) include using ramp-up procedures, using marine vibroseis, or the least powerful airguns to meet survey needs, providing breaks in surveys to allow transit for migrating salmon, and restricting surveys to periods when the fewest species and least vulnerable life stages are present should avoid and minimize most impacts. In addition, any activity that would potentially impact EFH or marine mammals would require consultation with the National Marine Fisheries Service (NMFS) and an incidental harassment authorization.

## **4. Oil Spill Issues**

Oil spill issues raised by commenters included contamination and spill impacts, spill response and contingency plans, inclement winter weather conditions, and the Exxon Valdez oil spill. Commenters noted that an oil spill in the License Area would be difficult or impossible to contain especially in winter, would be carried by the Alaska Current northwest to the Copper River delta where tidal currents would carry oil past the barrier islands into the delta, and that oil would be difficult to remove from marshes, mudflats, and the primarily sediment shorelines. The potential for contamination and widespread impacts from an oil spill were noted by 55 percent of commenters. The lack of a current spill response and contingency plan and/or the lack of Geographic Response Strategies specific for the License Area were noted by 49 percent of commenters. Harsh winter weather conditions were noted by 47 percent of commenters, generally in the context of an inability to reach an oil spill in marine waters that would delay response for days to weeks. Several commenters, 34 percent, noted their previous experience with the Exxon Valdez spill and stated that Cordova, Prince William Sound, and the herring fishery have not recovered from this spill. Commenters believed that any exploration or development of oil in the License Area would eventually lead to a similar disaster that would devastate fisheries in the Copper River delta and the Cordova economy. A few commenters, 7 percent, expressed concern about the placement of a

pipeline and the potential for a spill from a pipeline in the License Area. Commenters noted a recent spill from the Keystone oil pipeline in North Dakota among other spills from pipelines.

**DNR Response:** The license applicant has previously prepared a spill response plan for oil and gas exploration in this region and has demonstrated awareness of the process of staging response equipment and retaining response organizations. A spill contingency plan would be required for any activities resulting from issuance of an exploration license. While there are no specific Geographic Response Strategies for the Bering River/Controller Bay area, the License Area is covered by the Alaska Regional Contingency Plan (ARRT 2018), and the Prince William Sound Area Contingency Plan (ADEC 2018).

Oil and gas exploration, development, and production activity timing restrictions, designed to prevent disturbance to wildlife and fisheries, would restrict activities to winter months when weather and sea conditions are more hazardous (see Chapter Three). This seasonal restriction could push oil and gas mobilization, activity, and demobilization operations into more hazardous winter weather conditions which could cause a higher risk for accidents. Mitigation measure in Chapter Nine prohibit oil and gas infrastructure within ½ mile from anadromous waters, and limit drilling to onshore locations. These measures would reduce the risk of catastrophic spills from drilling or oil storage facility accidents from reaching marine waters. The greatest potential for a spill to reach marine waters would likely be from a marine terminal or a shipping accident (Frittelli 2014). The history of spills from Valdez Marine Terminal from 2000 to 2019 indicate that most crude oil spills at the terminal occurred on land (78 percent by occurrence, 76 percent by volume) and with the cause by volume for a total of 1,112 gallons spilled – human error 49 percent, structural/mechanical 28 percent, and other/unknown 23 percent. Spills of crude oil to water at the Valdez Marine Terminal were 24 percent by volume and 23 percent by occurrence with the cause by volume for a total of 350 gallons spilled – structural/mechanical 58 percent, unknown 24 percent (ADEC 2020).

Additional information on likely types and volumes of spills from marine operations was incorporated into Chapter Six. While DNR acknowledges that the Exxon Valdez oil spill was devastating and that a small area of residual oil remains in Prince William Sound, the scientific consensus is that most of the biological resources damaged by the spill have recovered (Wiens 2013; EVOSTC 2014; Michel et al. 2016).

DNR considered the implications and possible placement of a pipeline from the License Area for transporting oil to either the Trans Alaska Pipeline System or a terminal location near Cordova. Data from several studies suggest that pipelines are safer than moving oil by train, or truck. Subsea pipelines would be prohibited under the current proposed mitigation measures in Chapter Nine. DNR considered over land pipeline routes would require a minimum of 100 miles of pipeline and portions of the route would likely be required to run along the Copper River valley and/or cross the Copper River one or more times. The potential for large spills from any pipeline is low, but potential spills from a pipeline through the Copper River drainage could reach the river and impact the fishery. Revisions have been made to include additional information concerning oil spills from pipelines in Alaska to Chapter Six.



## 5. Other Issues

### a. Climate Change

Some commenters, 17 percent, were concerned with the effects of climate change in Alaska; and that production and burning of oil and gas (fossil fuels) would further contribute to climate change. Climate change was considered to result in stronger storms in the Gulf of Alaska. Concern was expressed that the finding did not identify and assess recent climate change information or include mitigation measures for climate change. Some commenters requested that DNR restrict new oil and gas leases and promote renewable energy development such as wind, tidal, hydropower, and solar energy development.

**DNR Response:** The climate section in Chapter Three was revised to provide additional information on the local climate and recent climate change. Data describing seasonal nearshore wind conditions was added. Recent climate change effects, including the effects of recent warm water masses in the Gulf of Alaska and projected climate change effects on fisheries were incorporated into the section (Haufler et al. 2010; Mathis et al. 2015; Johnson 2016; Markon et al. 2018; ACRC 2019b, a; Thoman and Walsh 2019; Piatt et al. 2020). Emissions from oil and gas exploration and development would be subject to regulation under ADEC's air quality regulations described in Chapter Seven. The function of the DO&G is to manages lands for oil, gas, and geothermal exploration and development to maximize prudent use of resources for the greatest benefit for all Alaskans. Most of Alaska's income, 80 percent, that goes to fund state government, basic services, and capital projects, as well as the Permanent Fund that distributes money to individual Alaskans and funds state government, is derived from production of Alaska's oil and gas resources.

### b. Cultural Resources

Several commenters, 22 percent, described that the area is rich in traditional use and cultural resources and that this land is considered sacred for thousands of Alaskan Natives because of the numerous subsistence, village, and burial sites. Commenters noted that the Katalla region has a tradition of use by Eyak, Tlingit, and Chugach Eskimo tribes.

**DNR Response:** Operators are required to conduct cultural resource surveys prior to any ground-disturbing impacts as described in Chapter Seven. Operators are also required to consult with subsistence users, to avoid and minimize prevent unreasonable conflicts with subsistence, commercial, or sport harvest activities and to ensure that access to traditional and customary subsistence areas is maintained or that reasonable alternative access is provided to subsistence users as described in Chapter Nine.

## 6. Best Interests

About a third of commenters, 32 percent, stated that issuance of this exploration license was not in the state's best interest primarily because of habitat value; 76 percent of commenters cited conflicts with commercial fisheries; and 63 percent cited financial concerns over providing support for or participation in commercial, subsistence, and sport fisheries and tourism. Oil spills were considered inevitable by most commenters, who felt that the value of Copper River salmon would be

jeopardized by any oil and gas exploration. Some commenters, 12 percent, noted contamination and abandoned equipment left by the license applicant during previous oil and gas exploration in this region.

Lack of safe access, difficulty in mobilizing drilling rigs and equipment to and from the License Area, and transportation risks for commercial production from the License Area were noted by 12 percent of commenters as concerns.

**DNR Response:** We have considered the concerns expressed by commenters and additional concerns expressed by agency reviewers. DNR believes that a catastrophic oil spill from oil and gas exploration and development in the region is highly unlikely, but a valid concern considering the emotion still evoked by the Exxon Valdez oil spill that occurred 31 years ago. The State of Alaska last sought to make the Katalla and Yakataga region available for oil and gas leasing as Sale 79 in 1995, which met with similar opposition from Cordova area fishers and residents. Lease Sale 79 was cancelled after the Controller Bay area was removed from the sale. Although the risk of a similar catastrophic spill seems very small based on the probability of such events, and current drilling and transportation technologies; numerous small to medium spills are likely to occur over the life of an oil field. By limiting drilling to onshore locations, the likelihood that an oil spill would reach rivers or coastal waters would be reduced, although the risk would not be eliminated. There is evidence that past oil development at Katalla resulted in numerous spills and active natural oil seeps in the region likely contribute to background levels of hydrocarbon contamination. Additional discussion of oil spill response, fate and transport have been added to Chapters Six and Eight of the Final Written Finding to inform the director's decision.

DNR has agreed to consider potential impacts to habitats in this area and to consider the value and use of these habitats when developing a disposal decision (USFS et al. 1986). After considering the value of the coastal waters for commercial, subsistence, and sport fisheries; migration staging for significant proportions of shorebird populations; and marine mammals that may be present in the License Area; mitigation measures were selected to reduce conflicts between oil and gas activities and these important resources and other uses. Mitigation measures which include seasonal restrictions in concert with prohibiting any drilling or infrastructure in offshore waters or within a buffer zone from anadromous streams on shore are in place to eliminate conflicts with commercial, sport and subsistence fishing activities. These measures will also reduce any conflicts with migratory birds and marine mammals in and around the License Area.

DNR has considered the difficulties in potential access to and transportation methods for production if a discovery is made. The existence of a petroleum resource in the License Area is unquestioned and this resource previously supported commercial oil production. The existence of a petroleum resource capable of supporting commercial production under current economic conditions, however, remains unknown, and will remain unknown without further exploration including seismic and exploratory drilling. The mobilization of exploration equipment to the proposed staging area on the west side of the Katalla River is likely to be difficult and problematic. The bar at the mouth of the Katalla River shifts and appears to be about 3 feet deep with a narrow entrance and shoals on both sides potentially rendering barge mobilization impractical (NOS 2019). Proposed mitigation measures require seasonal restrictions to protect wildlife and avoid interference with fisheries by limiting exploration and development activities to the winter months. Limiting exploration and development activities to winter further compounds logistical challenges

with potential harsh weather conditions. DNR has considered the challenges and risks associated with potential methods for transporting oil from the License Area if a commercial quantity of oil is discovered. The only state land available for a marine terminal and tank farm would be near Palm Point in Katalla Bay. Because this area is shallow with boulder reefs dredging and potentially blasting would be necessary to accommodate the smallest class tank vessels at drafts of 20 to 58 feet (NOS 2019). Alternatively, to reach appropriate water depths a terminal platform would need to be placed about 1 mile offshore, although current proposed mitigation in the License Area does not allow offshore structures. In addition, seasonal restrictions could limit loading/shipping activities to winter when winds and waves are strongest. Exporting production by pipeline would entail the permitting and constructing about 100 miles of pipeline that would likely need to parallel and/or cross the Copper River, over mountainous terrain and moving ice fields in an active seismic area. Design and construction of such a pipeline, while feasible, would require a very large resource to justify the expense.

## Appendix A: Summary of Comments and Responses

**Table A-3. Comment topics by commenter for issues on the preliminary written finding.**

Commenter by Type Topic Codes	Topic Codes Arranged by Issue																						
	Process		Fishery				Habitat							Oil Spill				Other		Best Interest			
	1	6	2	5	9	17	8	11	12	15	16	20	21	3	4	14	19	7	10	13	18	22	23
<b>Agencies</b>																							
ADF&G			1	1	1	1	1	1	1	1	1	1	1	1									
NMFS			1	1					1		1												
USFS																							
<b>Agency Total</b>			2	2	1	1	1	1	2	1	2	1	1	1									
Cordova			1	1			1							1	1						1		
Eyak			1	1	1		1							1	1	1	1	1		1	1		1
<b>Com. Fishers</b>																							
Anderson, Kris				1	1	1								1		1				1			
Babic, Russell				1																	1		
Blanchard, David				1											1	1							
Bogatchev, Sergei			1	1																	1		
Brockert, Peter			1	1	1													1		1			
Buscher, Wade			1	1			1							1	1	1				1		1	
Carlson, Kenneth			1	1	1	1			1		1			1	1	1				1	1		1
Carpenter, Danny			1	1					1	1				1	1	1	1			1	1		1
Cheremnov, Greg			1	1										1	1	1	1				1		
Davis, Brent				1																1	1		
Dunton, Nathan			1	1										1	1	1					1		
Foode, Jamie			1	1	1		1							1	1		1	1		1			
Glasen, Michael			1	1													1				1	1	
Gross, Geoff				1										1	1	1					1		
Herschleb, John				1										1							1		
Herschleb, Kent				1												1					1		
Honkola, James			1	1	1	1														1	1		
Kleissler, Alyssa							1			1										1			
Kokborg, Erik			1	1							1			1	1	1					1		
Lee, Jason			1	1	1									1	1	1				1	1		
Lindow, William			1	1	1		1							1	1	1					1		
Mahoney, Michael			1	1										1		1				1	1	1	
Mans, Greg			1	1						1													
Marchant, Samuel			1	1																	1		
Mickelson, Mike			1	1	1									1		1						1	1
Niland, Michelle			1		1																		
Nowicki, Mitchell			1	1					1	1				1	1	1				1			
Olsen, Stanley				1										1			1						
Potter, Carol			1	1			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Privat, Jacob				1										1									
R*, Brit			1	1								1											
Schmidt, Rion			1	1	1					1		1			1		1		1		1		
Schoonmaker, S.			1	1			1								1	1				1	1		
Shi*, Tracey			1	1							1										1		
Stack, John			1	1					1	1											1		
Vican, Steve														1	1	1	1			1	1		
Webber, Michael				1										1				1		1	1		
Webber, Misa														1			1						

# Appendix A: Summary of Comments and Responses

Commenter by Type	Topic Codes Arranged by Issue																							
	Process		Fishery				Habitat						Oil Spill				Other		Best Interest					
Topic Codes	1	6	2	5	9	17	8	11	12	15	16	20	21	3	4	14	19	7	10	13	18	22	23	
White, Frank			1	1																				
Zadra, Dennis												1		1	1	1					1		1	
Commercial Fishers																								
Total			26	35	10	3	3	4	5	7	4	4	1	22	17	19	9	1	5	14	27	4	5	
Commercial Fishers/SER VS																								
Black, Bill				1											1	1	1				1			
Carrel, Marc			1	1										1	1	1					1			
Godes, Toni			1	1										1	1	1					1		1	
Harrison, Tania			1	1			1			1				1		1					1			
Hazeltine, Mark				1	1	1								1	1	1					1			
Reynolds, Brad			1	1			1								1	1					1			
Song*, Arel				1					1	1				1	1						1			
Fishers/SER VS Total			4	7	1	1	2		1	2				5	6	6	1				7		1	
Commercial Guides																								
Hawkinson, Colby			1	1		1					1		1		1	1					1			
Laird, Katharine			1	1						1				1	1	1	1		1		1	1	1	
Ranney, Steve				1		1								1		1					1	1	1	
Commercial Guides Total			2	3		2				1	1		1	2	2	3	1		1		1	3	2	2
Public																								
Adel, Sean Den				1	1			1						1	1	1	1		1		1	1	1	
Allison, Brian				1										1				1			1	1		
Americus, Ellen				1	1			1							1	1			1					
Anonymous				1										1	1		1							
Baker, Karl and Bird, Nancy			1	1			1		1	1	1	1	1	1	1	1		1	1		1			
Baker, Torie				1	1	1	1								1	1					1			
Berceli, Robert							1		1															
Blake, David			1	1		1					1			1	1	1	1							
Bowman, Aaron			1	1	1	1				1		1		1	1	1	1				1			
Brockert, Isaiah			1	1										1			1				1			
Bucaria, Garvan								1		1				1	1	1							1	
Corcoran, Mary				1	1					1			1	1		1	1				1	1		
Craig, Leo			1	1										1	1			1	1		1			
Dickerson, S.							1																	
Donohue, Joe			1		1								1				1				1	1		
Duveen, Sandy			1		1										1		1	1						
Falta, Milos			1				1								1	1	1							
Galera, Erika			1	1	1												1	1			1			
Gilman, Darin				1										1	1	1								
Gold, Jillian				1												1					1	1		
Goodrich, Marjorie							1							1			1				1			
Gorman, Kristen			1	1	1									1		1	1	1	1		1			
Griffith, James				1										1	1	1		1	1		1			
Hawxhurst, Dorne			1	1						1		1			1	1	1	1	1		1			
Heffner, G. and G.				1		1				1				1										
Holleman, M.			1	1			1				1		1		1				1		1	1		
Idohuntak*, D.																								
Jarrell, Heather			1	1				1						1	1		1	1			1	1		
Johnson, Kara			1	1					1	1	1				1	1	1	1	1		1			
Johnson, Rose				1										1							1			
Kallander, Rachel				1												1		1			1			

# Appendix A: Summary of Comments and Responses

Commenter by Type	Topic Codes Arranged by Issue																						
	Process		Fishery				Habitat						Oil Spill				Other		Best Interest				
Topic Codes	1	6	2	5	9	17	8	11	12	15	16	20	21	3	4	14	19	7	10	13	18	22	23
Kazdan, Barbara								1												1			
Keogh, Denis			1	1						1		1				1	1	1	1		1		1
Kesti, Susan							1							1	1					1	1		
King, Sandra							1								1								
Kinsman, Jaqai														1	1	1	1				1		
Kirchmeier, J.																							
Lowney, Pete				1													1				1		
Luttrell, Mark														1				1	1	1			
Maxwell, Matthew			1	1	1	1					1			1	1	1	1				1		
Mickelson, M. B.			1	1						1					1	1	1	1	1		1		
Molé, Chris				1									1								1		
Mosenfelder, Kelly																							
Muma, Quin			1	1								1		1			1				1	1	
Naujokas, Samuel			1	1										1				1					
O'Toole, Makena			1	1			1									1					1	1	
Padawer, Lauren			1	1			1			1					1	1	1	1	1		1		
Pahl, James			1	1										1									
Parker, Sara			1	1			1			1	1			1	1	1					1		1
Perron, Lari				1								1		1	1					1	1		
Phillips, Jeff				1											1		1						
Pirog, Tom	1		1	1										1									
Ranney, Kris																				1		1	1
Ranney, Wendy															1	1						1	1
Reynolds, Julie			1											1			1			1	1		
Riedel, Felecia and Butler, Tom			1	1									1								1		
Shively, John																					1		
Smith, Jim				1	1												1		1		1		
Solomon, Barbara			1	1			1			1		1			1	1		1	1		1		
Steiner, Rick				1			1				1			1									
Steritz, Skye			1	1	1			1	1					1					1		1		
Strange, Jennifer				1						1				1	1		1		1		1	1	
Thomas, Thea			1					1		1													
Urton, Holly																	1				1		
Wellman, David			1				1							1	1	1	1	1					
Wheeler, Jeanne														1					1		1		
Widmann, Nathan			1	1						1		1		1	1	1		1	1		1		
Wiese, Kendra																							
Wray, Jessica				1								1		1	1				1		1	1	
Zamzow, Erin				1										1									
Zamzow, Kendra				1		1		1		1				1		1		1				1	
Public Total	1		31	47	12	6	16	8	4	16	7	9	5	37	32	28	28	20	19	18	39	6	6
NGOs																							
Audubon, PWS							1			1				1	1	1						1	
Cascadia Wildlands				1	1	1								1	1	1		1		1		1	
Cordova District Fishermen United	1	1	1	1							1			1	1	1	1			1	1		
CR/PWS Marketing Assoc.			1	1						1					1	1				1	1		
CRD Shorebird Festival Com.										1			1							1	1		

## Appendix A: Summary of Comments and Responses

Commenter by Type	Topic Codes Arranged by Issue																						
	Process		Fishery				Habitat							Oil Spill				Other		Best Interest			
Topic Codes	1	6	2	5	9	17	8	11	12	15	16	20	21	3	4	14	19	7	10	13	18	22	23
Eyak Preservation Council	1		1	1	1		1	1		1	1			1	1	1	1		1	1	1		
Native Land Conservancy			1	1	1		1		1	1	1	1		1	1	1	1		1	1	1	1	
Ocean Conserv. Research			1	1				1			1			1			1	1		1	1		
The Ocean Foundation			1	1			1		1	1		1			1		1		1	1	1	1	
Wild Salmon Center/Salmon State			1	1	1	1	1		1	1				1		1	1	1		1	1		1
<b>NGO Total</b>	<b>2</b>	<b>1</b>	<b>7</b>	<b>8</b>	<b>4</b>	<b>2</b>	<b>5</b>	<b>2</b>	<b>3</b>	<b>6</b>	<b>5</b>	<b>2</b>	<b>1</b>	<b>7</b>	<b>7</b>	<b>7</b>	<b>6</b>	<b>2</b>	<b>4</b>	<b>9</b>	<b>8</b>	<b>5</b>	<b>1</b>
<b>Grand Total</b>	<b>2</b>	<b>2</b>	<b>74</b>	<b>104</b>	<b>29</b>	<b>15</b>	<b>27</b>	<b>17</b>	<b>15</b>	<b>33</b>	<b>19</b>	<b>16</b>	<b>9</b>	<b>75</b>	<b>67</b>	<b>64</b>	<b>46</b>	<b>23</b>	<b>30</b>	<b>43</b>	<b>86</b>	<b>17</b>	<b>16</b>

## B. MOA Meeting February 27, 2017

DNR held a meeting with USFS on the 1992 Memorandum of Agreement (MOA) on interim guidance for management authority for uplifted and subsided coastal lands resulting from the 1964 earthquake within or adjacent to the Chugach or Tongass National Forests. Neither agency is permitted to dispose or obligate coastal lands without giving notice to the other agency. Permanent disposals of coastal lands as well as leases or permits exceeding 10 years requires prior notice and written concurrence. The pending exploration license application boundary includes coastal lands where known movement resulting from the 1964 earthquake has occurred that are covered under the 1992 MOA.

**Conclusion:** After multiple discussions, USFS concluded that there would be land and subsistence management consequences for both the State of Alaska and the United States, and that a reasonable resolution would be a land exchange. USFS requested that the state remove the coastal lands from the License Area until a long-term resolution is reached. The boundaries of the License Area do not currently include the coastal lands, but this written finding contemplates their inclusion if a future resolution grants clear title and management of those coastal lands to the state.

## C. MOU Consultation October 25, 2016

On September 20, 2016 the DO&G initiated the consultation process for the Copper River Delta Fish and Wildlife Memorandum of Understanding (MOU) between the USFS, BLM, USFWS, and ADF&G; and a meeting with the respective parties was held on October 25, 2016. Points raised during the consultation meeting included:

### 1. USFS

USFS requested additional site-specific information because they felt that the Controller Bay map did not contain enough information to make meaningful comments. USFS requested information on the application and whether there would be seismic surveys, exploratory drilling, or production structures and stated that the information provided was insufficient. USFS stated that the MOU covers an area that contains high value fish and wildlife habitat and urged DNR to consider fish and wildlife and expects DNR to uphold the commitments made in the MOU in any decision.

**DNR response:** DNR explained that the exploration license application does not have details about where activities may occur; but that the license allows seismic and exploratory drilling after a plan of operations is approved. These activities require the licensee to acquire and comply with multiple permits from DNR and other agencies that would undergo a public review process.

### 2. BLM

BLM requests more detail from DNR about the application and the process so that BLM can provide more specific mitigation measures. BLM stated that this is critical fish and wildlife habitat, and any impacts from oil and gas can affect the Copper River watershed, Prince William Sound, and subsistence uses in those areas. BLM requested that DNR consider this in the decision and that if development is authorized, protection of this critical fish and wildlife habitat is key. BLM



requested that DNR provide more information to agencies as more details about the application and potential activities become available to allow for further input.

**DNR response:** DNR explained that the exploration license application does not have details about where activities may occur. DNR suggested that agencies review recent areawide lease sale written findings to see the scope of information DNR requests and for potential mitigation measures.

### 3. USFWS

USFWS requested using the consultation this meeting to gather information, and state that the types of mitigation measures would be influenced by the location of activities. USFWS stated that it looks like the current License Area covers lands managed by BLM, Native corporations, and national forest, and asked if the state lands could be used for staging. USFWS requested more detail regarding the application and potential activities that may occur under a license and requested minimum surface disturbance. Important issues included migratory birds and shorebirds, subsistence fisheries, the Copper River delta, and consideration of Gulf of Alaska currents. Mitigation measures should include using down shield lights, limitations on aerial structures, and having a designated Geographic Emergency Response Area with caches of oil spill response equipment.

**DNR response:** DNR explained that the exploration license application does not have details about where activities may occur. DNR explained that there is an ongoing process of title research, and that there are lands in different status in and around the License Area, and that use of uplands for staging was a reasonable scenario.

### 4. ADF&G

ADF&G stated that without more information more restrictive mitigation measures would be recommended. A main concern for ADF&G is migratory waterfowl and shorebirds, and they would recommend restrictive timing windows, such as no exploration activity between April and October. Waterfowl of concern include: the Tule white-fronted geese and trumpeter swans. Setbacks from trumpeter swan nests would be recommended. Another concern is the gillnet fisheries in Controller bay, and ADF&G would recommend a restrictive timing window on exploration activities between May and October. ADF&G asked if the licensee would be required to consult and obtain appropriate permit and follow the processes for the Endangered Species Act, Marine Mammal Protection Act, Migratory Bird Treaty Act, and other applicable statutes and regulations. ADF&G commented that there are many productive tidelands in that area which serve as feeding areas; and ADF&G would not want fill or activity in any tidelands, and that drilling rigs should be located out of mud to avoid difficulty in removal. ADF&G asked if DNR includes Federal Aviation Administration (FAA) flyover advisories. In addition, ADF&G noted that a special permit is required for any activities in the Copper River Delta Fish and Wildlife Management Area.

**DNR response:** DNR explained that the exploration license application does not have details about where activities may occur. DNR has no authority over FAA flyovers, and does no longer includes lessee advisories in mitigations. DNR restated that the licensee is responsible for complying with all applicable statutes and regulations as is explained in DNR's written findings. DNR also clarified

that mitigation measures added to the written finding will apply to a permit or a plan of operations for the licensee. DNR coordinated development of mitigation measures submitted by the cooperating agencies that were incorporated into the preliminary written finding.

## **D. Comments and Responses to May 21, 2015 Solicitation**

### **1. State of Alaska Division of Parks and Outdoor Recreation, Office of History and Archaeology**

**Anchorage, AK, May 29, 2015, Judith Bitner, State Historic Preservation Officer**

The Office of History and Archaeology (OHA) commented that state law requires licensing or permitting from the State of Alaska to comply with the Alaska Historic Preservation Act. The Alaska Historic Preservation Act requires reporting of historic and archaeological sites on lands licensed by the state. According to the Alaska Heritage Resources Survey database, there are 126 reported cultural resource sites within the solicitation area. The resource types identified include paleontological, prehistoric, Russian-era, and early 20th century era sites.

OHA stated because there are no specific plans included in the solicitation, they are unable to comment definitively on the potential for conflicts. Depending on project specifics, it may be necessary for DO&G to consider hiring a qualified cultural professional to review and survey the project areas to assess the potential effects of the project on cultural resources. If there is Federal involvement with the project that it is the statutory obligation of the lead Federal agency to comply with Section 106 of the National Historic Preservation Act.

**DNR response:** DNR recognizes the importance of preservation of cultural resources and reporting of newly discovered historic and archaeological sites during the course of any activities on the ground that could impact those cultural resources. As described in Chapter Seven of this best interest finding, AS 41.35.010 declares it is the policy of the state to preserve and protect the historic, prehistoric, and archeological resources of Alaska from loss, desecration, and destruction so that the scientific, historic, and cultural heritage embodied in these resources may pass undiminished to future generations. The licensee will be required to coordinate and permit the on-the-ground work with OHA before any ground disturbing work can move forward.

### **2. Trust Land Office**

**Anchorage, AK, June 15, 2015, Dr. Karsten Eden, Minerals and Energy Section Chief**

The Trust Land Office represents the Alaska Mental Health Trust Authority which is a significant land owner in the Icy Bay area. The Trust Land Office stated that they are a strong advocate for oil and gas development in the Gulf of Alaska. They stated that the solicitation map incorrectly identifies Trust land as state land and clarified that any parties interested in oil and gas exploration on their land would need to negotiate a lease agreement with the Trust Land Office.

**DNR response:** DNR recognizes that the map provided in the solicitation does not identify all of the land ownership or status included in the region. However, the map provided in this best interest

finding is more focused on the actual License Area and land ownership and management. Following the issuance of this exploration license, the licensee will be required to seek additional permissions from any landowner other than the state to gain access and proceed with any exploration activities.

### **3. David Janka**

**Cordova, AK, June 19, 2015, Owner/Operator Auklet Charter Services,**

Mr. Janka stated concern that an oil spill or other pollution resulting from oil and gas activity would impact the Copper River Delta and Prince William Sound. Mr. Janka requested cancelling the solicitation.

**DNR response:** DNR has considered the comments and the identified concerns. In the written finding, Chapter Seven, Governmental Powers to Regulate Oil and Gas, of this best interest finding identifies the agencies responsible for regulating and responding to any release of fuels or hazardous substances. The review and permitting of exploration activities will be coordinated through DEC's Spill Prevention and Response program as well as the US Coast Guard. DNR also recognizes the potential effects from oil and gas exploration and development and we have included an evaluation of these reasonably foreseeable effects in Chapter Eight, of this best interest finding. Additionally, DNR has included mitigation measures in Chapter Nine of this best interest finding to reduce and minimize those potential effects.

### **4. Cascadia Wildlands**

**Cordova, AK, June 20, 2015, Gabriel Scott, Alaska Legal Director**

Cascadia Wildlands (CW) stated that their staff and members would be adversely impacted by the approval of an exploration license for oil and gas. CW requested that DNR produce a preliminary best interest finding for the potential disposal of lands in an exploration license. They stated that the solicitation document was vague and the area too large to allow for meaningful comment. A preliminary finding would allow for the state, applicant and public to engage in a meaningful exchange of information to enable a decision under Article VIII of the Alaska Land Act.

CW suggested that the DNR not overly phase our analysis of oil development. CW recommended DNR should take into account the reasonably foreseeable cumulative effects of the proposal. They are concerned that there is no existing infrastructure in the solicitation area to support oil and gas development. They are concerned that there is not a suitable location for oil and gas development because of the logistical constraints of the lack of roads and lack of deep-water port locations. Extreme weather is common in the area and could limit the siting of facilities in the solicitation area. CW stated that the solicitation materials do not provide adequate information regarding competing allowable uses and references the planning documents that address the other competing uses.

CW listed species of specific concern including bears, mountain goats, salmon, marine mammals, and migratory birds. The potential benefits to the state are low as the area has been previously

explored with limited success, because of the logistical problems due to the remoteness of the solicitation area. They are concerned that DNR consider the threat of global climate change.

CW stated that due to this remoteness, spill response would be problematic and DNR should consider the problems associated with the most recent contingency plan associated with exploratory drilling near Katalla. Legal and illegal hunting has decreased the populations of some species and recommended a mitigation measure to not allow company employees to hunt or trap.

**DNR response:** Comments were solicited from the public on May 21, 2015 and the comment period was extended on June 8, 2015 to allow for public participation in the process until August 3, 2015. DO&G is issuing a preliminary best interest finding for this exploration license, and additional comments will be solicited following its issuance.

DO&G evaluates the cumulative effects of oil and gas development at several phases of the development because we learn more about the prospective project, initially through the proposal, and then again at later phases including a subsequent plan of exploration, plan of operation or a plan of development. If this project advances to those phases, DO&G will take the opportunity to take another hard look at the potential cumulative effects of the specific project plans. At this phase of approving the exploration license, DO&G evaluates the reasonably foreseeable effects of oil and gas development that extends beyond this initial phase and this is discussed in Chapter Eight, Reasonably Foreseeable Effects of Licensing and Subsequent Activities, of this best interest finding. The commenter expressed concerns regarding the exploration license area's propensity for dangerous weather conditions, and this is discussed in Chapter Three, Description of the License Area, in the discussion of the natural hazards. Logistics and facility siting may be a challenge for this project and the various agencies that are responsible for permitting, inspection and compliance are discussed in Chapter Seven, Governmental Powers to Regulate Oil and Gas, of this best interest finding. DO&G, in coordination, with these other agencies will remain responsible for reviewing applications for permits associated with this project and will continue to protect the state's interest when making decisions about specific plans for siting of facilities and logistics of future activities. Additionally, mitigation measures included in Chapter Nine address specific restrictions and protective measures for siting of facilities.

Protection and management of the species of concern listed in CW's comment is the responsibility of the Alaska Department of Fish and Game (ADF&G). As stated in Chapter Seven of this best interest finding, ADF&G has statutory responsibility to protect, maintain, and improve the fish, game, and aquatic plant resources of the state, and manage their use and development in the interest of the economy and general well-being of the people of the state (AS 16.05.020(2)), consistent with the sustained yield principle. Additionally, mitigation measures included in Chapter Nine address specific restrictions and protective measures for fish, wildlife and their habitat.

## **5. Barbara Rady Kazdan**

**Silver Spring, MD, June 27, 2015**

Ms. Rady Kazdan is opposed to DNR using public funds for resource extraction in the Copper River region because of the importance of the commercial and subsistence fishing grounds in the region.

**DNR response:** DNR is not proposing to spend any public funds for resource extraction as a part of this exploration license associated with this best interest finding. All expenditures will be the responsibility of the licensee, and those expenditures will be reported to DO&G on an annual basis along with any seismic or exploration data gathered during that time.

As stated in Chapter Seven, *Governmental Powers to Regulate Oil and Gas*, of this best interest finding, ADF&G has statutory responsibility to protect, maintain, and improve the fish, game, and aquatic plant resources of the state, and manage their use and development in the interest of the economy and general well-being of the people of the state (AS 16.05.020(2)), consistent with the sustained yield principle.

## 6. US Department of Agriculture, Forest Service

**Anchorage, AK, July 9, 2015, Robert Skorkowsky, District Ranger**

Mr. Skorkowsky commented on behalf of the United States Forest Service. Mr. Skorkowsky requested additional information on the proposal. It is unclear if the proposal is limited to parcels of surface estate owned by the state of Alaska or if it includes tidally influenced coastal lands and areas offshore.

Mr. Skorkowsky requested a more detailed map identifying the areas which are being considered for leasing. There is a 1992 Memorandum of Agreement (MOA) regarding the management of coastal lands in Alaska. That there is a multi-agency Copper River Delta Fish and Wildlife Management Area Memorandum of Understanding (MOU) from 1986 regarding cooperative management of the Copper River Delta Fish and Wildlife Management Area. Both the MOU and MOA contain agreements for interagency consultation prior to a disposal.

**DNR response:** The proposal and exploration license include areas offshore out to the 3-mile state boundary. The proposal was not limited and included lands owned by the United States Forest Service, however the exploration license is limited to state owned unencumbered lands. A more detailed map of the exploration license and surrounding land ownership is included in Chapter Three, Description of the License Area, of this best interest finding.

In accordance with the 1986 MOU, DO&G held a meeting with the participating agencies to review the proposal and solicited comments and suggestions for mitigation measures as required by the MOU. Many of the suggested mitigation measures have been included in Chapter Nine to address citing of facilities, seasonal restrictions and other protective measures for fish, wildlife and habitat.

In accordance with the MOA, DO&G and the Forest Service conducted separate meetings to discuss the land ownership and management concepts outlined in the MOA. In Controller Bay, state-owned tidal and submerged lands were uplifted as a result of the 1964 earthquake. Acreage that was previously below the mean high tide line are now state-owned uplands. DNR is seeking quiet title to the coastal lands defined in the MOA and is including those coastal lands within the boundary of the License Area.

## 7. David Lynn Grimes

**Cordova, AK, July 14, 2015**

Mr. Grimes stated that he is interested in the conservation of fish and wildlife habitat in the state's best interest. Oil and gas development leads to industrial spills and accidents. The Alaska Coastal Current would carry any spills into the ocean towards the Copper River delta and Prince William Sound which is still recovering from the 1989 *Exxon Valdez* Oil Spill. A spill could result in negative effects on the salmon industry in Alaska. The Copper River Delta Critical Habitat Area is managed for the conservation of fish, wildlife, and their habitat.

Mr. Grimes stated the region is considered the jewel in the crown of the Western Hemisphere flyway because of its crucial role in the survival of coastal migratory water birds. The Copper River delta has been designated a Western Hemisphere Shorebird Reserve Hemisphere Site.

**DNR response:** DNR recognizes the importance of conservation of fish, wildlife and their habitat in concert with the state's constitutional mandate to maximize the state's natural resources. As stated in Chapter Seven, Governmental Powers to Regulate Oil and Gas, of this best interest finding, ADF&G has statutory responsibility to protect, maintain, and improve the fish, game, and aquatic plant resources of the state, and manage their use and development in the interest of the economy and general well-being of the people of the state (AS 16.05.020(2)), consistent with the sustained yield principle. Additionally, Chapter Seven identifies the agencies responsible for regulating and responding to any release of fuels or hazardous substances and the review and permitting of exploration activities will be coordinated through DEC's Spill Prevention and Response program as well as the US Coast Guard.

DNR has considered the comments and the identified concerns. In the written finding, mitigation measures described in Chapter Nine are established to reduce the potential for oil spills and minimize the impacts of all spills through contingency plans and spill response plans.

DNR included additional mitigation measures in this written finding to prohibit surface activities in the Copper River Delta State Critical Habitat Area for this exploration license, as well as impose seasonal restrictions and other protective measures for fish, wildlife and their habitat.

## 8. Cordova District Fishermen United

**Cordova, AK, July 28, 2015, Alexis Cooper, Executive Director**

Ms. Cooper stated that the Cordova District Fishermen United (CDFU) currently represents over 800 fishing families in the Prince William Sound and Copper River delta region. Their mission is to preserve, promote, and perpetuate that commercial fishing industry for future generations. The Copper River is home to a world-class salmon fishery that has supported the livelihoods of commercial fishermen, the community of Cordova, the State Alaska and native Alaskans for generations.

CDFU cited a June 2015 McDowell Group report on the economic impact of the commercial fishing industry in Southcentral Alaska communities, which notes Cordova as the most seafood dependent community in the region and 14th among US fishing ports in terms of value and volume.

Portions of the solicitation area are within the ADF&G commercial fishing district boundaries where up to 300 vessels can be fishing.

The coastal area in the Gulf of Alaska provides habitat for Pacific herring and Weathervane scallop that hold subsistence and commercial value. CDFU stated that following the *Exxon Valdez* Oil Spill the face of the community and the abundance of fishing opportunities was forever changed. Their organization does not believe that exploration or lease sales in the area are in the best interests of the state of Alaska until technologies become available that do not pose a substantial risk to the renewable resources and industry of the region.

**DNR response:** DNR understands the importance of the commercial fishing industry in the Gulf of Alaska and specifically the Copper River delta region. For these reasons, DNR has included additional mitigation measures in this best interest finding to prohibit surface activities in the Copper River Delta State Critical Habitat Area associated with the exploration license. DNR also recognizes the potential effects from oil and gas exploration and development and we have included an evaluation of these reasonably foreseeable effects in Chapter Eight, Reasonably Foreseeable Effects of Licensing and Subsequent Activity, of this best interest finding. Additionally, DNR has included mitigation measures in Chapter Nine of this best interest finding to reduce and minimize those potential impacts.

Spill response techniques and technology have improved since the time of the Exxon Valdez oil spill and other agencies including ADEC are responsible for review of spill prevention and response plans for any proposed activity associated with this exploration license. Those responsibilities are discussed in Chapter Seven, Governmental Powers to Regulate Oil and Gas, of this best interest finding.

## 9. Copper River Watershed Project

**Cordova, AK, July 29, 2015, Kristin Carpenter, Executive Director**

The Copper River Watershed Project (CRWP) stated they support sustainable economic development for the watershed but concluded that oil development presents a conflict with fisheries resources that support the southcentral Alaskan economy. The Copper River Delta State Critical Habitat Area was created to protect fisheries, waterfowl, and shorebird resources in the coastal area. The State of Alaska entered into a Memorandum of Understanding with the US Department of Agriculture, Western Hemisphere Shorebird Reserve Network, the Chugach Alaska Corporation, the Eyak Corporation, the City of Cordova, and the USFWS to administer lands within the Critical Habitat Area and the Copper River Delta Shorebird Unit consistent with the legislature's intent for those lands and with the Prince William Sound Area Plan.

In their letter, they describe that salmon and scallop fisheries are managed by the state of Alaska near Kayak Island and along the entire coast north of Yakutat. These fisheries occur less than three miles offshore and could be greatly affected by an oil spill in that area. CRWP contends that allowing oil and gas development will create a “public risk for private gain” situation where the fisheries resource users with the most to lose have the least amount of control over how the oil and gas resources are developed.

The region has first-hand experience with an oil transport disaster with the *Exxon Valdez* which affected pink salmon prices for 15 years, and losses were felt throughout the fishing industry. Polycyclic aromatic hydrocarbons, which are the residual part of oil particles are now known to be 1,000 times more toxic than previously accounted for. CRWP stated that the sandy beaches in the Copper River delta area would be more difficult to clean up from an oil spill than the rocky shores in Prince William Sound. CRWP also stated that the Division of Geological and Geophysical Surveys already analyzed this area for Lease Sale 79 and concluded that "natural processes in this area will impose severe constraints to exploration, production, and transportation activities associated with possible petroleum development". CRWP stated that the same concerns still exist today.

**DNR response:** DNR understands the importance of the commercial fishing industry in the Gulf of Alaska and specifically the Copper River delta region. For these reasons, DNR has included additional mitigation measures to prohibit surface activities in the Copper River Delta State Critical Habitat Area in this exploration license. DNR also recognizes the potential effects from oil and gas exploration and development and we have included an evaluation of these reasonably foreseeable effects in Chapter Eight, Reasonably Foreseeable Effects of Licensing and Subsequent Activities, of this best interest finding. Additionally, DNR has included mitigation measures in Chapter Nine of this best interest finding to reduce and minimize those potential impacts.

Spill response techniques and technology have improved since the time of the Exxon Valdez oil spill and other agencies including ADEC are responsible for review of spill prevention and response plans for any proposed activity associated with this exploration license. Those responsibilities are discussed in Chapter Seven, Governmental Powers to Regulate Oil and Gas, of this best interest finding.

DNR recognizes the limitations and constraints that the weather and exposed coastline will have on any future infrastructure and oil and gas activities in the region. The natural hazards of this region are discussed in Chapter Three, Description of the License Area. It is the responsibility of the licensee to prepare for adverse conditions, and the responsibility of ADEC and other governmental agencies to ensure that plans are in place and approved to prevent any release of hazardous substances as a result of dangerous conditions.

## **10. ADF&G Division of Habitat**

**July 30, 2015, Greg Albrecht, Habitat Biologist**

Mr. Albrecht represents the ADF&G Division of Habitat and has coordinated this request for comments and agency information with Region I and Region II staff from the Divisions of Habitat, Subsistence, Sport Fish, Commercial Fisheries, and Wildlife Conservation. He stated the Yakataga State Game Refuge (YSGR) is in the solicitation area and was established to protect fish and wildlife habitat and populations, public use of fish, wildlife, and their habitat, and the use and disposition of other resources when the activities are not inconsistent with those protections.

The YSGR Management Plan requires nonrenewable resource exploration and extraction to be conducted in a manner compatible with the goals and policies of the YSGR Management Plan. The Copper River Delta Critical Habitat Area which lies west of Point Martin was established by the



Alaska Legislature in 1978 to protect and preserve habitat areas especially crucial for the perpetuation of fish and wildlife. Each spring, approximately 12 million shorebirds (the largest gathering in the western hemisphere) stop along the shores of the Copper River delta on their way to nesting grounds further north. Several special area permits are required for activities conducted in the YSGR and CRDCHA.

Mr. Albrecht stated that activities below the ordinary high-water mark of waters identified in the Catalog of Waters Important for the Spawning, Rearing, or Migration of Anadromous Fishes require fish habitat permits pursuant to the Anadromous Fish Act (AS 16.05.871(b)). Activities in waterbodies containing resident fish require fish passage permits pursuant to the Fishway Act (AS 16.05.841). Mr. Albrecht attached a copy of the Copper River Delta Fish and Wildlife Interagency Memorandum of Understanding (MOU). Parties to the MOU agree to consult with each other before issuing authorizations for oil or mineral explorations. Cordova residents use the Copper River, its delta, and Kayak Island for subsistence fishing and hunting, and subsistence information for these areas will be available in fall 2015.

Mr. Albrecht stated that the rivers and streams in the solicitation area contain five species of Pacific salmon, cutthroat trout, Dolly Varden, char, steelhead, and eulachon. He listed several rivers in the area that are important systems for sockeye and Coho salmon harvest. Wildlife in the area includes moose, wolves, brown and black bear, goats, wolverine, small mammals, trumpeter swans, migratory birds. Mr. Albrecht stated that the Copper River delta is listed on the Western Hemisphere Shorebird Reserve Network as a Site of Hemispheric Importance.

Mr. Albrecht stated the range of harvests for various species of game animals. Avoiding disturbance in areas where trumpeter swan nests, bear or wolf dens occur will minimize negative effects to these animals. Marine mammals in the area include harbor seals, Steller sea lions, killer whales, and Pacific white-sided minke whales. The area is in the historical distribution of the North Pacific right whale which is endangered under the ESA and listed as depleted under the Marine Mammal Protection Act.

Mr. Albrecht stated that the endangered population of Steller sea lions west of Cape Suckling has an active haul out at Cape St. Elias, and up to 1,490 animals from the endangered western Distinct Population and the delisted eastern Distinct Population Segment have been observed at this location during ADF&G surveys. The highest densities of hauled out harbor seals occur on the shores of Vitus Lake, the Seal River, and along the shoreline west to Kayak Island. The National Oceanic and Atmospheric Administration National Marine Fisheries Service is responsible for managing cetaceans and pinnipeds, except walrus, in United States waters.

**DNR response:** DNR understands the value and importance of the resources in the Yakataga State Game Refuge and the Copper River Delta State Critical Habitat Area and have included mitigation measures into this written finding to prohibit surface activities in the Copper River Delta State Critical Habitat Area from this exploration license. The License Area is approximately 60 miles west of the Cape Yakataga State Game Refuge.

Chapter Four, Fish Wildlife and Habitat considers and discusses the various species that reside and migrate through the License Area. Chapter Five considers the current and projected uses of the License Area. Chapter Seven, Governmental Powers to Regulate Oil and Gas, discusses how the

licensee is responsible for knowing and complying with all applicable state, federal, and local laws, regulations, policies, and ordinances. Reasonably foreseeable effects from oil and gas exploration and development are considered and discussed in Chapter Eight of this best interest finding. Mitigation measures to prevent and reduce adverse effects are included in Chapter Nine of this best interest finding to reduce the potential for adverse effects to the fish wildlife and habitat in and around the License Area.

## 11. Alaska Scallop Association

**Cordova, AK, July 31, 2015, Bruce Weyhrauch, Legal Counsel**

Mr. Weyhrauch stated concern over interactions between oil and gas exploration and scallop fishing activities. Commercial scallop fishermen should be compensated from a fund financed by exploration companies if gear or vessels are damaged or lost. Scallop fishermen should be compensated for any lost habitat due to exploration activities in the Solicitation Area. The Solicitation Area contains some of the highest known densities of weathervane scallops in Alaska.

Mr. Weyhrauch stated that fishing season for weathervane scallops is generally from July 1 - February 15. There is a scallop Fisheries Management Plan and the scallop fishery is managed by ADF&G and National Marine Fisheries Service (NMFS). The Fisheries Management Plan outlines concerns about oil and gas exploration as well as a list of recommendations. Oil and gas exploration should be prohibited or limited in the solicitation area.

Mr. Weyhrauch also included a petition to adopt regulations so that DNR would establish a compensation fund financed by the exploration companies to reimburse fishermen for any claimed damages resulting from interactions with oil and gas activities.

**DNR response:** DNR received, responded to, and denied Mr. Weyhrauch's petition to adopt regulations regarding a compensation fund to reimburse fishermen for claimed damages from interactions with oil and gas activities. Any damage to fishing vessels or equipment from oil and gas infrastructure would be negotiated with the operator on a case by case basis.

DNR appreciates the importance of the scallop fishing industry and has excluded the areas that are identified as scallop fishing grounds in this proposed exploration license. DNR has considered the comments and the identified concerns. In the written finding, Chapter Seven, Governmental Powers to Regulate Oil and Gas, of this written finding identifies ADF&G and NMFS's role in regulating the fishery.

## 12. Lauren Padawer

**Cordova, AK, August 2, 2015**

Ms. Padawer stated that she is concerned about the current application for oil and gas exploration in the Copper River delta and the Gulf of Alaska. The area consists of prime commercial and subsistence fishing grounds for Copper River salmon. She believes there would be significant adverse impacts to fish and wildlife species and their habitats and the uses of those resources.

**DNR response:** DNR has considered the comments and the identified concerns. In the written finding, reasonably foreseeable effects from oil and gas exploration and development are considered and discussed in Chapter Eight of this best interest finding. Upon identifying reasonably foreseeable effects to fish and wildlife and their habitats, mitigation measures are developed to mitigate or eliminate those identified effects. Mitigation measures to prevent and reduce adverse effects are included in Chapter Nine of this best interest.

### 13. Melissa Fraser

Cordova, AK, August 2, 2015

Ms. Fraser stated she is against the exploration and extraction of any oil in the Gulf of Alaska.

**DNR response:** The Alaska Constitution provides that the state’s policy is “to encourage...the development of its resources by making them available for maximum use consistent with the public interest” and that the “legislature shall provide for the utilization, development, and conservation of all natural resources belonging to the State...for the maximum benefit of its people” (Alaska Constitution, article VIII, §1 and 2). Exploring for oil and gas resources is a vital part of that mandate, and the exploration licensing is an important program to discover and maximize those resources.

Reasonably foreseeable effects from oil and gas exploration and development are considered and discussed in Chapter Eight of this best interest finding. Mitigation measures to prevent and reduce adverse effects are included in Chapter Nine of this best interest finding to reduce the potential for adverse effects to the environment.

### 14. Ryan Schuetze

Cordova, AK, August 2, 2015

Mr. Schuetze stated that he is strongly opposed to any oil and gas exploration in the Gulf of Alaska or Copper River delta. He is a commercial fisherman and resident of Cordova and does not trust any assurances that there would be no risk, and that Cordova would likely not benefit financially from any development taking place in the area because of the lack of infrastructure and borough to collect taxes. Because the comment period was open during fishing season that the comment period should be extended until the middle of September to allow community members to become better educated on the topic.

**DNR response:** The Alaska Constitution provides that the state’s policy is “to encourage...the development of its resources by making them available for maximum use consistent with the public interest” and that the “legislature shall provide for the utilization, development, and conservation of all natural resources belonging to the State...for the maximum benefit of its people” (Alaska Constitution, article VIII, §1 and 2). Exploring for oil and gas resources is a vital part of that mandate, and the exploration licensing is an important program to discover and maximize those resources.

Comments were solicited from the public on May 21, 2015 and the comment period was extended on June 8, 2015 to allow for public participation in the process until August 3, 2015.

Reasonably foreseeable effects from oil and gas exploration and development are considered and discussed in Chapter Eight of this best interest finding. Mitigation measures to prevent and reduce adverse effects are included in Chapter Nine of this best interest finding to reduce the potential for adverse effects to the environment.

## 15. Erica Clark

August 2, 2015

Ms. Clark stated that she is strongly opposed to any oil and gas exploration or lease in the Gulf of Alaska and the Copper River delta. Hundreds of Alaskan families depend on these waters as a source of income from commercial fishing. The potential negative impacts of exploration could have catastrophic financial impacts.

**DNR response:** The Alaska Constitution provides that the state’s policy is “to encourage...the development of its resources by making them available for maximum use consistent with the public interest” and that the “legislature shall provide for the utilization, development, and conservation of all natural resources belonging to the State...for the maximum benefit of its people” (Alaska Constitution, article VIII, §1 and 2). Exploring for oil and gas resources is a vital part of that mandate, and the exploration licensing is an important program to discover and maximize those resources.

DNR has considered the comments and the identified concerns. In the written finding, reasonably foreseeable effects from oil and gas exploration and development are considered and discussed in Chapter Eight of this best interest finding. Mitigation measures to prevent and reduce adverse effects are included in Chapter Nine of this best interest finding to reduce the potential for adverse effects to the environment.

## 16. US Department of Agriculture, Forest Service

Anchorage, AK, August 3, 2015, Robert Skorkowsky, District Ranger

Mr. Skorkowsky stated National Forest Service Lands within the solicitation area are managed with the primary objective for the conservation of fish and wildlife and their habitat. Mr. Skorkowsky stated that this stems from ANILCA Section 501. United States Department of Agriculture, United States Forest Service (USFS) with the Bureau of Land Management, ADF&G, United States Fish and Wildlife Service are parties to a Memorandum of Understanding (MOU). If proposals are received that could affect the Management Area or coastal lands within the Chugach National Forest Boundary, interagency consultation is required prior to the issuance of leases for oil, minerals or other resource development activities.

Mr. Skorkowsky requested the opportunity to consult and concur with the proposals prior to issuance of any license, permit or other authorization. Mr. Skorkowsky also provided a Memorandum of Agreement (MOA) regarding the management of coastal lands in which the DNR and USFS have agreed to obtain written concurrence when a permitted or leased use of coastal lands is anticipated to exceed 10 years. The coastal lands in the area are considered to have a high probability for the presence of archaeological sites according to Forest Service heritage specialist. Several of the sites are pending adjudication and possible conveyance to the Chugach Alaska Corporation.

Mr. Skorkowsky stated a potential for oil and gas development increases the potential for an oil spill. Gulf of Alaska currents move from east to west, so any release would likely be carried to the

Bering and Copper River deltas with drastic effects on prime salmon habitat and economic impacts as well.

**DNR response:** The exploration license boundary is limited to state owned unencumbered lands. A more detailed map of the exploration license and surrounding land ownership is included in Chapter Three, Description of the License Area, of this best interest finding.

In accordance with the 1986 MOU, DO&G held a meeting with the participating agencies to review the proposal and solicited comments and suggestions for mitigation measures as required by the MOU. Many of the suggested mitigation measures have been included in Chapter Nine to address citing of facilities, seasonal restrictions and other protective measures for fish, wildlife, and habitat.

In accordance with the MOA, DO&G and the Forest Service conducted separate meetings to discuss the land ownership and management concepts outlined in the MOA. In Controller Bay, state-owned tidal and submerged lands were uplifted as a result of the 1964 earthquake. Acreage that was previously below the mean high tide line are now state-owned uplands. DNR is seeking quiet title to the coastal lands defined in the MOA and is including those coastal lands within the boundary of the License Area.

## **17. Ellen Americus**

**Cordova, AK, August 3, 2015**

Ms. Americus requested that no oil and gas exploration occur in the Gulf of Alaska because the area is one of the richest areas for wildlife on the planet, and it should be protected as a national park.

**DNR response:** It is outside DNR's authority to recommend or administer lands to create a national park. Additionally, it is beyond the scope of this best interest finding to discuss changes of land ownership. DNR recognizes the importance of fish and wildlife to the region and have made a decision to include additional mitigation measures prohibiting surface activities within the Copper River Delta State Critical Habitat Area in an effort to support the conservation of the region's fish, wildlife, and habitat as well as many other mitigation measures designed to protect the fish, wildlife and habitats of the License Area.

## **18. Prince William Sound Audubon Society**

**Cordova, AK, August 3, 2015, Mary Anne Bishop, President**

The Prince William Sound Audubon Society (PWSAS) is based in Cordova and represents members from Cordova and throughout the Prince William Sound region. PWSAS stated that there are several geographic areas within the proposed drilling area that provide critical habitat for fish and wildlife. Icy Bay is critical foraging habitat for marbled murrelet and Kittlitz's murrelet.

PWSAS stated that the Tsiu River has a world class salmon run and several fishing lodges are located on the river. Kayak Island has a Stellar Sea Lion rookery, a black-legged kittiwake colony, and are spawning grounds for Pacific herring. Wingham Island and the Martin Islands all have

seabird colonies. The Martin Islands are also an important haul out area for sea lions. The mudflats at Controller Bay provide waterfowl and shorebird habitat and large flocks of snow geese, scoters, and other waterfowl are regularly observed in Controller Bay.

PWSAS stated that studies show the importance of the region as a stopover for many migratory bird species. Salmon runs in the region are the fishing grounds for local subsistence use and a commercial gillnet fleet with over 500 permits. They are concerned about the cumulative impacts oil and gas drilling could have on the fish and wildlife resources in the proposed area. They are also concerned that the area has been identified as a likely site for a future earthquake and that future oil and gas exploration should be banned in the area.

**DNR response:** DNR understands the value of the state critical habitats in the region and has included additional mitigation measures that prohibit surface activities within the Copper River Delta State Critical Habitat Area, and have excluded Icy Bay, or the Tsiu River drainage in this exploration license. As explained in Chapter Seven, Governmental Powers to Regulate Oil and Gas, it is the role of ADF&G to review each permit application for activities associated with this exploration license or any other activity before it may commence and determine if those activities will adversely affect the natural habitat and the resident and migratory species of concern.

The natural hazards of this region are considered and discussed in Chapter Three, Description of the License Area, of this best interest finding including earthquakes, glacial outburst flooding, and the climate and weather. It is the responsibility of the licensee to plan and prepare for these hazards, however, spill prevention and contingency plans will be required and reviewed by ADEC as discussed in Chapter Seven, Governmental Powers to Regulate Oil and Gas, of this best interest finding to mitigate these potential hazards during activities on the license.

DNR also recognizes the potential effects from oil and gas exploration and development and we have included an evaluation of these reasonably foreseeable effects in Chapter Eight, Reasonably Foreseeable Effects of Licensing and Subsequent Activity, of this best interest finding. Additionally, DNR has included mitigation measures in Chapter Nine of this best interest finding to reduce and minimize those potential impacts.

## **19. Dune Lankard**

**Cordova, AK, August 3, 2015**

Mr. Lankard stated that he is opposed to any oil and gas drilling in the Copper River delta or Gulf of Alaska region. The applicants for the exploration license should be identified to the public. Only a small amount of oil was ever recovered in the region. There are still effects from the *Exxon Valdez* Oil Spill that have not been cleaned up and the wildlife has not recovered.

Mr. Lankard stated that the region is critical habitat for fish and wildlife, and that the communities rely on subsistence and commercial fishing. The region is an earthquake zone. The area's glaciers are melting rapidly and icebergs from the Bering Glacier are a hazard for boat traffic. Glacial outburst flooding can occur in the Bering, Yagataga, and White Rivers.

Mr. Lankard is an Eyak Athabaskan Native, subsistence and commercial fisherman, and the Eyak people have survived and thrived in this region for 3,500 years and that the region is sacred to them.

Alaska is experiencing climate change and if development is allowed to occur then the companies and government should establish a restoration fund to compensate people for a lost economy and clean up the environment.

**DNR response:** DNR understands the value of the habitats in the region and has included additional mitigation measures that prohibit surface activities within the Copper River Delta State Critical Habitat Area in this exploration license, among many other mitigation measures designed to protect the fish, wildlife and habitats of the License Area.

The natural hazards of this region are considered and discussed in Chapter Three, Description of the License Area, of this best interest finding including earthquakes, glacial outburst flooding, and the climate and weather. It is the responsibility of the licensee to plan and prepare for these hazards, however, spill prevention and contingency plans will be required and reviewed by ADEC as discussed in Chapter Seven, Governmental Powers to Regulate Oil and Gas, of this written finding to mitigate these potential hazards during activities on the license.

DNR has considered the comments and the identified concerns. In the written finding, the current and projected uses of the area including subsistence, commercial and sport fishing are discussed in Chapter Five, Current and Projected Uses, and a description of the salmon resources, as well as other species that inhabit and migrate through the License Area are discussed in Chapter Four, Habitats, Fish, and Wildlife. Under AS 38.05.035(g)(vi) DNR must discuss the “reasonably foreseeable cumulative effects of oil and gas exploration, development, production, and transportation on the License Area, including effects on subsistence uses, fish and wildlife habitat and populations and their uses, and historic and cultural resources.” This is done in Chapter Eight, Reasonably Foreseeable Effects of Licensing and Subsequent Activities. Mitigation measures in Chapter Nine provide that the commissioner will restrict lease-related use when he or she determines it is necessary to prevent unreasonable conflicts with subsistence harvests and commercial fishing.

## **20. Department of Interior, National Park Service**

**Anchorage, AK, August 3, 2015, Debora Cooper, Associate Regional Director for Resources**

Ms. Cooper represents the National Park Service (NPS) and stated that portions of the Wrangell-Saint Elias National Park (WSNP) are within the exploration solicitation area. There are state lands within the park boundary and the solicitation area and NPS stated that oil or gas operations on state lands within the boundary of the National Park would be subject to NPS regulations.

NPS stated that the Wrangell Saint. Elias National Park was established by ANILCA to maintain unimpaired scenic beauty and wildlife and for recreational opportunities. The state's planning process should recognize the resources and values for which the WSNP was established and fully evaluate effects on the NPS values. NPS resources and values should be evaluated on lands adjacent to the park as well. No authority to lease federally owned minerals in NPS units in Alaska has been provided by Congress.

NPS stated that if drilling and production occur on state lands that could result in drainage of federally owned minerals, the NPS would notify the BLM. If damage is caused to park resources in



the park boundary from operations outside the boundary, the NPS has authority to recover up to treble damages under the System Unit Resource Protection Act 54 USC 100722. They are concerned about short-term and long-term impacts to park resources. NPS requested continuing dialog with the Division and other stakeholders for the continued development of exploration project stipulations, and that the solicitation boundary be altered to exclude NPS administered areas.

NPS stated that it would be prudent to exclude areas interior and in front of Icy Bay from the solicitation boundary because of the presence of marine mammal pupping areas. They suggested a 1-3-mile distance for any oil and gas activity from a park boundary. NPS requested the opportunity to review exploration license or lease sale information when it is available, especially on lands which may occur near the boundaries of the park.

**DNR response:** DNR has excluded any national park lands in this exploration license. The solicitation area boundary was drawn to be inclusive of surrounding areas and lands that are not owned by the State of Alaska in order to solicit comments from stakeholders outside the boundaries of this exploration license.

DNR will not be adding a new mitigation measure as suggested by NPS. Other mitigation measures along with state and federal requirements are sufficient to protect park resources. Regarding concerns about drainage, Alaska Oil and Gas Conservation Commission statutes were established to, among other things, protect correlative rights.

Chapter Four, Habitats, Fish, and Wildlife, discussion includes state and federally managed refuges, critical habitat area, parks and preserves, and other designated areas. Chapter Four also states that specific legislation provides additional protection of habitat that is important to fish and wildlife populations and recreational opportunities.

## **21. Eyak Preservation Council**

**Cordova, AK, August 3, 2015, Carol Hoover, Executive Director**

The Eyak Preservation Council (EPC) stated that the proposed area is known as one of the richest wildlife and wild salmon ecological baseline regions of coastlands and waters in North America. The area is designated critical habitat for many plant and wildlife species. The area supports one of the most valued commercial fisheries in Alaska famous for returns of salmon. These fisheries are successful because there is no oil and gas operations in the region. The area supports commercial tourism, hunting, and sport fishing. The subsistence users of the region are very significant, which support the Indigenous population and their cultural history.

EPC stated that the area contains archaeological sites that must be respected and preserved. Previous attempts for oil and gas exploration have been shut down because of lack of resource findings, severe weather, opposition from the regional communities, fishing and science-based groups, and state and federal policy makers. There is no evidence that oil and gas activities are safe for the environment. Increased pollution and the risk of an oil spill would threaten the salmon in the area.

EPC stated that the region is still suffering environmentally, economically, and socially from the 1989 *Exxon Valdez* Oil Spill. EPC stated that the 1993 Hazards section from Oil and Gas Lease Sale 79 states known hazards include earthquakes, seafloor hazards, tsunamis, volcanic eruptions, icebergs, glacial outburst flooding, landslides, avalanches, and severe storms as some of the regional concerns. The Lease Sale 79 overlaps some of the same areas in this solicitation. Climate change may heighten the geologic hazards.

EPC stated that research shows that ocean currents and winds in the region could bring an oil spill towards Cordova. They are adamantly opposed to this proposed exploration license application and requested that the DNR deny the request.

**DNR response:** DNR recognizes the importance of fish and wildlife to the region and has included mitigation measures prohibiting surface activities within the Copper River Delta State Critical Habitat Area in an effort to support the conservation of the region's fish, wildlife, and habitat as well as many other mitigation measures designed to protect the fish, wildlife and habitats of the License Area.

The cultural resources and history of the region are discussed in Chapter Three, Description of the License Area. The management of cultural resources for the state are enforced by the Office of History and Archaeology, and their role in protecting the cultural resources are discussed in Chapter Three, and in additional detail in Chapter Seven, Governmental Powers to Regulate Oil and Gas. Additionally, mitigation measures are included in this best interest finding to protect and preserve the cultural resources within the License Area.

The natural hazards of this region are considered and discussed in Chapter Three, Description of the License Area, of this best interest finding including earthquakes, glacial outburst flooding, and the climate and weather. It is the responsibility of the licensee to plan and prepare for these hazards, however, spill prevention and contingency plans will be required and reviewed by ADEC as discussed in Chapter Seven, Governmental Powers to Regulate Oil and Gas, of this written finding to mitigate these potential hazards during activities on the License Area.

DNR has considered the comments and the identified concerns. In the written finding, the current and projected uses of the area including subsistence, commercial and sport fishing are discussed in Chapter Five, Current and Projected Uses, and a description of the salmon resources, as well as other species that inhabit and migrate through the License Area are discussed in Chapter Four, Habitats, Fish, and Wildlife. Under AS 38.05.035(g)(vi) DNR must discuss the "reasonably foreseeable cumulative effects of oil and gas exploration, development, production, and transportation on the License Area, including effects on subsistence uses, fish and wildlife habitat and populations and their uses, and historic and cultural resources." This is done in Chapter Eight, Reasonably Foreseeable Effects of Licensing and Subsequent Activities. Mitigation measures in Chapter Nine provide that the commissioner will restrict lease-related use when he or she determines it is necessary to prevent unreasonable conflicts with subsistence harvests and commercial fishing.

A discussion of the spill response techniques and technology and how they have improved since the time of the Exxon Valdez oil spill is included in Chapter Six. Other agencies including ADEC and United States Coast Guard are responsible for review of spill prevention and response plans for any

proposed activity associated with this exploration license. Those responsibilities are discussed in Chapter Seven of this best interest finding.

## **22. Sarah Keller**

**Fairbanks, AK, August 3, 2015**

Ms. Keller stated that she is concerned that oil and gas exploration is incompatible with irreplaceable habitat for avian species that use the area for breeding, resting, and feeding during spring and fall migrations. She is concerned about the salmon industry in the event of an oil spill. The weather and ocean conditions in this region are harsh and unpredictable. The area is a very active seismic zone and it would seem unwise to risk additional lives, habitat, and state equipment on exploration in this area. This is a risky and expensive area to look for oil and gas.

**DNR response:** DNR recognizes the importance of fish and wildlife to the region and has included mitigation measures prohibiting surface activities within the Copper River Delta State Critical Habitat Area in an effort to support the conservation of the region's fish, wildlife, and habitat as well as many other mitigation measures designed to protect the fish, wildlife, and habitats of the License Area.

DNR recognizes the limitations and constraints that the weather and exposed coastline, and seismic activity will have on any future infrastructure and oil and gas activities in the region. The natural hazards of this region are discussed in Chapter Three, Description of the License Area. It is the responsibility of the licensee to prepare for adverse conditions, and the responsibility of ADEC and other governmental agencies to ensure that plans are in place and approved to prevent any release of hazardous substances as a result of dangerous conditions. DNR also recognizes the potential effects from oil and gas exploration and development and we have included an evaluation of these reasonably foreseeable effects in Chapter Eight, of this best interest finding. Additionally, DNR has included mitigation measures in Chapter Nine of this best interest finding to reduce and minimize those potential effects.

## **23. US Department of Interior, Fish and Wildlife Service**

**Anchorage, AK, August 3, 2015, Catherine Yeargan, Fish and Wildlife Biologist**

US Department of Interior, Fish and Wildlife Service (USFWS) stated that the project description and accompanying map do not provide enough information for the USFWS to adequately review the project for impacts. USFWS stated that these comments are general in nature and subject to revision as additional project information becomes available.

USFWS stated that the short-tailed albatross is an endangered species listed under the Endangered Species Act. USFWS stated the short-tailed albatross forage along the continental shelf of the Gulf of Alaska. USFWS stated that the potential effects of oil spills include oiling of feathers that can lead to decreased insulation and hypothermia, and ingestion of contaminated food items.

USFWS stated northern sea otters can be found in the solicitation area and are protected under the Marine Mammal Protection Act. USFWS stated that oil and gas activities may result in take of sea

otters, seismic operations can produce sound levels that have potential to cause hearing damage, and they are susceptible to the acute and chronic effects of spills in the marine environment. USFWS stated that the operator should contact USFWS Marine Mammals Management Office prior to conducting oil and gas activities that may result in take of otters.

USFWS stated that migratory birds are protected under the Migratory Bird Treaty Act. Migratory birds including bald eagles, can be sensitive to habitat alterations. USFWS suggested that the National Bald Eagle Management Guidelines should be consulted to avoid the risk of impacting eagles. USFWS stated that Controller Bay and the Bering River delta are heavily used by shorebirds during spring migration.

USFWS stated the nearby Copper River delta is one of the most important shorebird concentration sites in the world. USFWS listed several shorebirds that use this area during migration. USFWS stated that 12 seabird species are known to breed at colonies within the solicitation area. Four shorebirds are priority species for the USFWS in Alaska. Priority species include: Aleutian tern, red-faced cormorant, Kittlitz's murrelet, and marbled murrelet. Because of the importance of this area to migratory birds, USFWS recommended careful evaluation of proposed activities' impacts on the resources.

USFWS stated they are concerned about the effects that a large oil spill could have during spring migration. USFWS stated that spilled oil could be swept into the mudflats of the Copper River and Bering River deltas and impact important food sources upon which shorebirds rely.

**DNR response:** DNR recognizes the importance of fish and wildlife to the region and has included additional mitigation measures prohibiting surface activities within the Copper River Delta State Critical Habitat Area in an effort to support the conservation of the region's fish, wildlife, and habitat as well as many other mitigation measures designed to protect the fish, wildlife and habitats of the License Area.

DNR also recognizes the potential effects from oil and gas exploration and development and we have included an evaluation of these reasonably foreseeable effects in Chapter Eight of this written finding. Chapter Seven, Governmental Powers to Regulate Oil and Gas identifies USFWS's authority to issue incidental take permits under the ESA. DNR also recognizes the potential effects from oil and gas exploration and development and we have included an evaluation of these reasonably foreseeable effects in Chapter Eight, of this best interest finding. Additionally, DNR has included mitigation measures in Chapter Nine of this best interest finding to reduce and minimize those potential effects.

Northern sea otter, bald eagle, short tailed albatross, Aleutian tern, red-faced cormorant, Kittlitz's murrelet, and marbled murrelet are discussed in Chapter Four, Habitats, Fish, and Wildlife, and potential effects on these species are discussed in Chapter Eight of this best interest finding. References provided by USFWS in their comments were used to draft portions of this written finding.

A discussion of spill response techniques and technology is included in Chapter Six including how technology improved after the Exxon Valdez oil spill. Other agencies including ADEC are responsible for review of spill prevention and response plans for any proposed activity associated

with this exploration license. Those responsibilities are discussed in Chapter Seven, Governmental Powers to Regulate Oil and Gas, of this written finding.

## **24. Belle Mickelson**

**Cordova, AK August 3, 2015**

Ms. Mickelson stated that she is a resident of Cordova, and against the proposed oil and gas exploration on the east Copper River delta and Controller Bay to Icy Bay in the Gulf of Alaska. She stated that these wetlands produce some of the world's finest salmon, crab, halibut, and other fisheries, and contain critical habitat for shorebird migration.

Ms. Mickelson stated that the Copper River delta and Controller Bay fisheries supported the economy of Cordova while the Prince William Sound fishery recovered from the *Exxon Valdez* Oil Spill. The spring shorebird migration is one of the wonders of the world and has the largest concentration of birds in the western hemisphere. Ms. Mickelson requested that DNR say no to the proposed oil and gas development in this area.

**DNR response:** DNR recognizes the importance of fish and wildlife to the region and has included additional mitigation measures prohibiting surface activities within the Copper River Delta State Critical Habitat Area in an effort to support the conservation of the region's fish, wildlife, and habitat as well as many other mitigation measures designed to protect the fish, wildlife and habitats of the License Area. Chapter Seven, Governmental Powers to Regulate Oil and Gas, discusses how the licensee is responsible for knowing and complying with all applicable state, federal, and local laws, regulations, policies, and ordinances. DNR also recognizes the potential effects from oil and gas exploration and development and we have included an evaluation of these reasonably foreseeable effects in Chapter Eight, of this best interest finding. Additionally, DNR has included mitigation measures in Chapter Nine of this best interest finding to reduce and minimize those potential effects.

## **25. Julie Reynolds**

**Cordova, AK, August 3, 2015**

Ms. Reynolds stated that she is living and raising her family in Cordova, and her husband makes a living fishing for salmon. Ms. Reynolds requested that the state not explore for oil or natural gas in the Copper River delta or area west of Controller Bay to Icy Bay. Ms. Reynolds stated that the fishing fleet of Cordova already extract a precious, renewable natural resource from the area in salmon. Ms. Reynolds stated that exploring or extracting oil and gas from the area would negatively impact the salmon and her way of life.

**DNR response:** DNR recognizes the importance of fish and wildlife to the region and has included additional mitigation measures prohibiting surface activities within the Copper River Delta State Critical Habitat Area in an effort to support the conservation of the region's fish, wildlife, and habitat as well as many other mitigation measures designed to protect the fish, wildlife and habitats of the License Area. DNR has considered the comments and the identified concerns. In the written finding, Chapter Seven, Governmental Powers to Regulate Oil and Gas, discusses how the licensee

is responsible for knowing and complying with all applicable state, federal, and local laws, regulations, policies, and ordinances. DNR also recognizes the potential effects from oil and gas exploration and development and we have included an evaluation of these reasonably foreseeable effects in Chapter Eight, of this best interest finding. Additionally, DNR has included mitigation measures in Chapter Nine of this best interest finding to reduce and minimize those potential effects.

## 26. Pete Lowney

Valdez, AK, August 3, 2015

Mr. Lowney stated that he is completely opposed to the state opening the solicitation area for onshore and offshore oil and gas drilling. Mr. Lowney requested that the state extend the comment period by at least 30 days and that public meetings be held in the affected communities. Pristine areas of Alaska's coastline should be preserved for their wild, scenic, recreational, and habitat values. Mr. Lowney requested the state to reverse decisions allowing drilling in Bristol Bay and near ANWR.

**DNR response:** Reversal of the decisions regarding drilling in Bristol Bay and near the ANWR boundary are outside the scope of this best interest finding

DNR recognizes the importance of fish and wildlife to the region and has included additional mitigation measures prohibiting surface activities within the Copper River Delta State Critical Habitat Area in an effort to support the conservation of the region's fish, wildlife, and habitat as well as many other mitigation measures designed to protect the fish, wildlife and habitats of the License Area.

DNR also recognizes the potential effects from oil and gas exploration and development and has included an evaluation of these reasonably foreseeable effects in Chapter Eight, of this best interest finding. Additionally, DNR has included mitigation measures in Chapter Nine of this best interest finding to reduce and minimize those potential effects.

Comments were solicited from the public on May 21, 2015 and the comment period was extended on June 8, 2015 to allow for public participation in the process until August 3, 2015. The commissioner has the discretion to hold a public hearing under AS 38.05.946(a). No hearing is scheduled to be conducted at this time. Additionally, the director must make a written finding available before a public hearing can be conducted in accordance with AS 38.05.035(e)(6).

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Company Name: State of Alaska

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## Editor Delivery Events

## Status

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## Agent Delivery Events

## Status

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## Intermediary Delivery Events

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## Certified Delivery Events

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## Carbon Copy Events

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## Timestamp

## Witness Events

## Signature

## Timestamp

## Notary Events

## Signature

## Timestamp

## Envelope Summary Events

## Status

## Timestamps

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Hashed/Encrypted

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Certified Delivered

Security Checked

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Signing Complete

Security Checked

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Completed

Security Checked

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## Payment Events

## Status

## Timestamps

## Electronic Record and Signature Disclosure

## **ELECTRONIC RECORD AND SIGNATURE DISCLOSURE**

Please read this Electronic Records and Signature Disclosure (ERSD). It concerns your rights regarding electronically undertaking, and the conditions under which you and the State of Alaska agree to electronically undertake, the transaction to which it relates (the “TRANSACTION”).

### **Consent to Electronically Undertake the TRANSACTION**

You can electronically undertake the TRANSACTION only if you confirm that you meet the following requirements by selecting the box next to “I agree to use electronic records and signature” (the “AGREE BOX”):

1. you can fully access and have read this ERSD;
2. you can fully access all of the information in the other TRANSACTION records;
3. you can retain all of the TRANSACTION records in a form that you will be able to fully access for later reference;
4. you consent to undertake the TRANSACTION electronically; and
5. you are authorized to undertake the TRANSACTION. (Please note that falsely undertaking the TRANSACTION may subject you to civil liabilities and penalties and/or to criminal penalties.)

If you cannot or are not willing to confirm each of these five things, do not select the AGREE BOX.

### **Withdrawing Consent**

If you select the AGREE BOX, you can withdraw your consent to electronically undertake the TRANSACTION at any time before you complete the TRANSACTION: simply do not finalize it. The only consequence of withdrawing your consent is that you will not finalize the TRANSACTION.

If you select the AGREE BOX, your consent will apply only to this TRANSACTION. You must separately consent to electronically undertake any other transaction with the State of Alaska.

### **Paper Option for Undertaking the TRANSACTION**

You may undertake the TRANSACTION with the State of Alaska using paper records. (State of Alaska employees who want to undertake the TRANSACTION in paper should contact the agency responsible for the TRANSACTION.) Print the paper records on the website of the State of Alaska agency responsible for the TRANSACTION, or request them from the agency. The State of Alaska homepage is at <http://alaska.gov/>.

### **Copies of TRANSACTION Records**

After completing the TRANSACTION but before closing your web browser, you should download the TRANSACTION records. Or you can download the records within 30 days after

completing the TRANSACTION using the link in the DocuSign email sent to the email address you used to complete the TRANSACTION. The State of Alaska will not provide a paper copy of the TRANSACTION records as part of the TRANSACTION. Under the Alaska Public Records Act (APRA), AS 40.25.100–.295, you can request a copy from the agency responsible for the TRANSACTION, but if too much time has passed, the agency may no longer have the records when you make your request. If required under the APRA, the agency will charge a fee.

### **Required Hardware and Software**

For the minimum system requirements to electronically undertake the TRANSACTION, including accessing and thereby retaining the TRANSACTION records, visit <https://support.docusign.com/guides/signer-guide-signing-system-requirements>. These requirements may change. In addition, you need access to an email account.

### **How to Contact the State of Alaska**

To ask a question on this ERSD or the DocuSign document generated after you complete the TRANSACTION or on using DocuSign to electronically undertake the TRANSACTION, contact the Alaska Department of Administration at either of the following addresses:

State of Alaska  
Department of Administration  
550 West 7th Avenue  
Suite 1970  
Anchorage, AK 99501  
Reference: DocuSign

[doa.commissioner@alaska.gov](mailto:doa.commissioner@alaska.gov)  
Subject: DocuSign

To ask any other question on the TRANSACTION records or to update the information for contacting you electronically, contact the State of Alaska agency responsible for the TRANSACTION using the contact information in the TRANSACTION records or, if those records contain no contact information, using the contact information on the agency's website. Again, the State of Alaska homepage is at <http://alaska.gov/>.